RESTEK

INNOVATIVE CHROMATOGRAPHY PRODUCTS

2013–2014

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"Plus 1 involves doing everything we do as well as we can do it, every time we do it, and then doing more."

I love working at Restek. Every day, I am lucky enough to witness firsthand my fellow employee-owners serving our customers and each other with enthusiasm, dedication, and a smile. We call it "Plus 1."

Plus 1 involves doing everything we do as well as we can do it, every time we do it, and then doing more. Whether it's anticipating the needs of tomorrow with a new innovation, ensuring superior product quality, exceeding your expectations when you place an order, or troubleshooting a difficult issue, we always go above and beyond. Said another way, since 1985, Restek has grown into a global chromatography supplier, but we are still a small company at heart. By focusing on extraordinary products and service with a personal touch, we strive to earn your trust and make your job easier one interaction at a time.

This catalog is packed with cutting-edge solutions that exemplify our Plus 1 mentality. We are especially excited to introduce our newest breakthroughs: Our GCxGC selectivity kits (p. 50) simplify column selection for method developers and frequent GCxGC users alike, and our expanded collection of Sky® inlet liners (p. 175) brings exceptional inertness—even when using wool!—to more analyses than ever. USLC® toolboxes (p. 137) represent the widest range of reversed phase selectivity available with just four stationary phases, and EXP® reusable fittings (p. 313) allow you to achieve easy, yet reliable seals for HPLC and UHPLC. Our reference standard labs have gained ISO accreditation, so we now offer a full line of stock and custom certified reference materials (CRMs), and we've added a compound index starting on page 568, so finding the perfect standard is a snap. The list is far too long to include them all here, but you'll see "new" icons throughout this book highlighting our latest examples of Plus 1 product development.

Because Restek is 100% employee-owned, we are each personally invested in our success, and we know that success would not be possible without you. That's why we work tirelessly for you and why we invite you to challenge us. Flip through these pages to discover Plus 1 in action, and if there's anything we can assist you with, don't hesitate to put us to the test by calling or e-mailing!

Bryan Wolcott
President

RESTEK

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At Restek, we are committed to providing superior, cutting-edge chromatography products and world-class Plus 1 service. In order to give our global customer base more convenient access, we maintain a distributor network that covers over 100 countries across six continents. Whether you live in Maine or California, Albania or Zimbabwe, contact your local representative today to learn for yourself how we gained the trust of chromatographers around the world!

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Resolving Product / Order Issues and Returning Products

1) Are you prepared to provide the following information?

- Name, company name, address, and phone number.
- Product name, catalog number, lot and/or serial number, and quantity.
- Purchase order and/or invoice number.
- Detailed description of the problem.

2) How did you place your order?

- *If you ordered from a distributor or from outside the U.S.,* contact your distributor.
- *If you ordered directly from Restek and from within the U.S.,* continue reading.

3) Is the problem with a product's function or with your order?

- *If you have a problem with a product's function*
  (e.g., won't perform properly, results do not match our literature, instructions are unclear),
  contact Technical Service. Call 1-800-356-1688 / 1-814-353-1300, ext. 4
  or e-mail **support@restek.com**
- *If you have a problem with your order*
  (e.g., wrong part or quantity, broken or damaged item, missing items),
  contact our Returns Coordinator. Call 1-800-356-1688 / 1-814-353-1300, ext. 2146
  or e-mail **returns@restek.com**

4) Did you get a return material authorization (RMA) number?

(You *must* be given an RMA before you may send any product back to Restek.)

- *If the product has been used,* you *must* include a completed, signed Health & Safety Declaration (**www.restek.com/health-safety**).
- Send the product back following the instructions you were given by Restek.

Important Notes

- Do not return any product without first contacting us. We cannot accept returns without an RMA and prior authorization.
- Reference standards must be returned within ten (10) days from the shipment date; all other products must be returned within thirty (30) days. Restek can refuse to accept late returns.
- Returns made due to error by the customer placing the order may be charged a 10% restocking fee.
- To qualify for credit in the event of an order error, you must notify Restek within ten (10) days of shipment. Product must also be returned unused and in restockable condition.
- Restek will honor the original warranty of resale electronics; however, if the item is not under warranty, you are responsible for all repair costs.
- Returned columns and consumables will normally be evaluated within seven (7) working days after receipt.
- If you need replacement product immediately, ask for details when you contact us. Special invoicing and additional costs may apply.

General Warranty Information

Restek warrants the products it manufactures, except those specifically exempted, to be free from defects in materials and workmanship for ninety (90) days from the date of shipment. This warranty is limited to the original purchaser of the product and is not transferrable.During the warranty period, Restek will, at its option, either repair or replace a defective product or return to purchaser the price of the item. This limited warranty does not extend to any products that have been damaged as a result of accident, misuse, abuse, or service or modification by anyone.

Except as expressly set forth above, no other warranties are expressed or implied, including, but not limited to, any implied warranties of merchant-ability and fitness for a particular purpose, and Restek expressly disclaims all warranties not stated herein. In the event the product is not free from defect as warranted above, the purchaser's sole remedy shall be as provided above. Under no circumstances will Restek be liable to the purchaser or any user for any damages, including the incidental or consequential damages, expenses, lost profits, lost savings, or other damages arising out of the use or inability to use the product.

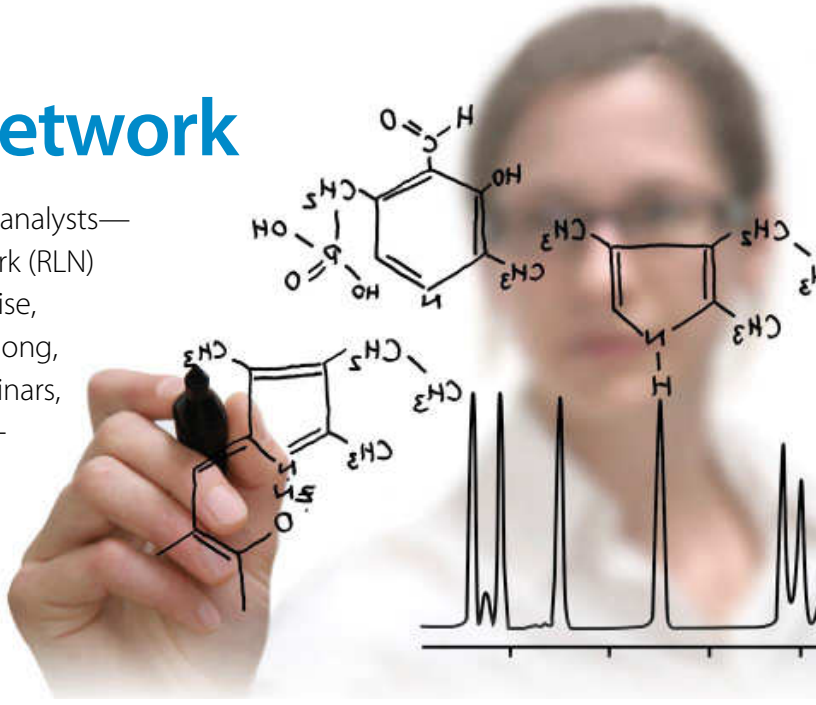
This warranty shall not be applicable to the extent that any provision of this warranty is prohibited by any federal, state, or municipal law that cannot be preempted.

U.S. Version - Prices valid thru 12/31/13. Restek reserves the right to change prices without notice.

important note

If you purchased the product through a distributor, you must obtain return authorization through that distributor.

Restek Learning Network



Well-trained chromatographers make productive analysts—and the widely acclaimed Restek Learning Network (RLN) offers training solutions to fit every level of expertise, budget, schedule, and analytical topic. From day-long, comprehensive seminars to shorter, focused webinars, the RLN provides a variety of educational and networking opportunities to help you reduce guesswork, improve throughput and reliability, and raise your confidence in generated data.

Seminars:

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For more information and to register for upcoming seminars, visit

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GC Columns

Fused Silica Capillary

Metal MXT® Capillary

PLOT

Packed/Micropacked

Columns

GC Columns

LC Columns

GC Columns

Fused Silica Capillary Columns (WCOT)

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Can't find the column you're looking for?

Check out our website at www.restek.com

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Table of Contents for
GC Chromatograms
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Metal MXT® Capillary Columns (WCOT)

For an alphabetical listing of phases, please see the Alphabetical Index on pages 756–767.

PLOT Columns

Packed/Micropacked Columns & Packing Materials

Selecting a GC Column

Strategic column choices can improve lab productivity by assuring that speed and resolution are optimized. While the number of choices available can be daunting, consideration of the resolution equation variables—separation factor, retention (capacity) factor, and efficiency—simplifies the decision. Separation factor determines which stationary phase is most appropriate. Once the phase has been chosen, physical dimensions (inner diameter, film thickness, length) can be selected based on retention factor and efficiency. Understanding how separation factor, retention factor, and efficiency influence separations allows analysts to make effective, informed choices and quickly select the best column for specific separations.

$$R = \frac{1}{4}\sqrt{N} \times \left(\frac{k}{k+1}\right) \times (\alpha - 1)$$

A measure of **Efficiency**. This term is affected by:	A measure of **Retention**. This term is affected by:	A measure of **Peak Separation**. This term is affected by:
• Length • Inner diameter • Carrier gas type and linear velocity	• Inner diameter • Film thickness • Temperature	• Stationary phase composition • Temperature

N = L/H = Effective theoretical plate number
L = Column length
H = HETP = Height equivalent to a theoretical plate

k = Retention factor
α = Separation factor
Baseline resolution (R = 1.5) is the goal.

Separation Factor (α)

Choosing the right stationary phase is the first step toward optimizing your GC separation. It is the most important decision you will make because separation factor (α) has the greatest impact on resolution, and it is strongly affected by stationary phase polarity and selectivity.

Stationary phase polarity is determined by the type and amount of functional groups in the stationary phase. Structures for Restek stationary phases are presented in order of polarity on page 17. When choosing a column, consider the polarity of both the stationary phase and your target analytes. If the stationary phase and analyte polarities are similar, then the attractive forces are strong and more retention will result. Greater retention often results in increased resolution. Stationary phase polarity strongly influences column selectivity and separation factor, making it a useful consideration when selecting a column.

Stationary phase selectivity is defined by IUPAC as the extent to which other substances interfere with the determination of a given substance. Selectivity is directly related to stationary phase composition and how it interacts with target compounds through intermolecular forces (e.g., hydrogen bonding, dispersion, dipole-dipole interactions, and shape selectivity). As methyl groups in the stationary phase are replaced by different functionalities, such as phenyl or cyanopropyl pendant groups, compounds that are more soluble with those functional groups (e.g., aromatics or polar compounds, respectively) will interact more and be retained longer, often leading to better resolution and increased selectivity. In another example of the effect of stationary phase-analyte interactions, an Rtx®-200 stationary phase is highly selective for analytes containing lone pair electrons, such as halogen, nitrogen, or carbonyl groups, due to interactions with the fluorine pendant group in this phase. Selectivity can be approximated using existing applications or retention indices (Table I), making these useful tools for comparing phases and deciding which is most appropriate for a specific analysis.

Table I: Kovat's retention indices for GC phases can be used to approximate selectivity.

Phase	Benzene	Butanol	Pentanone	Nitropropane
Rtx-1	651	651	667	705
Rtx-5/Rtx-5MS	667	667	689	743
Rtx-20	711	704	740	820
Rtx-1301/Rtx-624	689	729	739	816
Rtx-35	746	733	773	867
Rtx-200	738	758	884	980
Rtx-50	778	769	813	921
Rtx-1701	721	778	784	881
Rtx-65TG	794	779	825	938
Rtx-225	847	937	958	958
Stabilwax	963	1,158	998	1,230

Stationary phase polarity and selectivity also affect how much sample loading capacity the column will have for a particular analyte; the more soluble an analyte is in the stationary phase, the greater the sample loading capacity will be for that analyte. For example, a nonpolar stationary phase will have higher sample loading capacity for a nonpolar compound (e.g., pentane) than for a polar compound (e.g., ethanol).

The relationship between polarity, selectivity, and sample loading capacity can be illustrated using an example. Consider the analysis of benzene and butanol, which have nearly the same boiling point, on an Rtx®-20 column (diphenyl dimethyl polysiloxane stationary phase). Since the benzene molecule is structurally more similar to the diphenyl phase than butanol is, benzene will solvate into the stationary phase more readily than butanol based on the concept that "like dissolves like." Since benzene solvates more readily with the stationary phase, it has more interaction with the stationary phase as it elutes through the column and will be retained longer. Since butanol solvates less with the stationary phase, it has fewer interactions with the stationary phase and less will be retained. Therefore, the elution order of these two compounds on an Rtx®-20 column will be butanol first and benzene second. In addition, since benzene is more soluble in the diphenyl phase, the column has more capacity for benzene. This results in a more symmetrical peak shape for benzene than for butanol. A more polar column, such as a polyethylene glycol (PEG) column, will provide retention and better peak shape for butanol compared to benzene.

Due to their influence on separation factor, polarity and selectivity are primary considerations when selecting a column. However, temperature limits must also be considered. In general, highly polar stationary phases have lower maximum operating temperatures, so choosing a column with the appropriate maximum operating temperature, as well as optimal polarity and selectivity for the type of compounds being analyzed is crucial.

Retention Factor (k)

The retention factor (k) of a column is based on the time an analyte spends in the stationary phase relative to the time it spends in the carrier gas. It is influenced primarily by column inner diameter (ID), phase film thickness, and temperature. Retention factor is sometimes referred to as capacity factor, which should not be confused with sample loading capacity. As a general rule, the thicker the film and the smaller the inner diameter, the more an analyte will be retained. Note that as temperature increases, k decreases; therefore, at higher temperatures analytes stay in the carrier gas longer and are less retained.

When selecting column ID, consider the type of injection, the detector being used, and the concentration of sample (amount on-column). The injection technique is important because the column ID may need to be selected based on whether a split, splitless, direct, cool on-column injection, or other sample transfer method is being used. For example, 0.53 mm ID columns are ideal for cool on-column injections since the syringe needle (26 gauge) will fit into the large column ID. In addition to column ID, the detector and its flow requirements must be considered. For example, some MS detectors can only operate under column flow rates of up to 1.5 mL/min; therefore, a 0.53 mm ID column, which requires higher flows for proper chromatography, is not an option for MS work. Table II shows typical column characteristics for columns of various inner diameters.

Table II: General column characteristics based on ID.

	Column Inner Diameter (mm)					
Characteristic	**0.10**	**0.15**	**0.18**	**0.25**	**0.32**	**0.53**
Nitrogen flow (mL/min)	0.2	0.3	0.3	0.4	0.6	0.9
Helium flow (mL/min)	0.6	0.8	1.0	1.4	1.8	3.0
Hydrogen flow (mL/min)	0.7	1.1	1.3	1.8	2.3	3.7
Sample loading capacity (ng)	2.5	10	20	50	125	500
Theoretical plates/meter	11,000	7,000	6,000	4,000	3,000	2,000

Note: Flows listed are for maximum efficiency. Sample loading capacities are estimates only. Actual sample loading capacity varies with film thickness and analyte.

Film thickness has a direct effect on the retention and elution temperature for each sample component. Extremely volatile compounds should be analyzed on thick film columns to increase the time the compounds spend in the stationary phase, which allows them to better separate. High molecular weight compounds must be analyzed on thinner film columns. This reduces the length of time that the analytes stay in the column and minimizes phase bleed at higher elution temperatures. Film thickness also affects the amount of material that can be injected onto the column without overloading it. A thicker film column can be used for higher concentration samples.

Fused Silica, PLOT, & MXT® Capillary GC Column Ferrule Guide

GC Column ID	Ferrule ID
0.10 mm	0.4
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.28 mm	0.4
0.32 mm	0.5
0.45 mm	0.8
0.53 mm	0.8

Film thickness also directly affects phase ratio (β), which must be accounted for when changing to a column with a different inner diameter. When inner diameter increases, film thickness (d_f) must also increase in order to provide comparable resolution and retention. Table III shows β values for common column dimensions; similar values indicate similar separations on different ID columns.

Scott Grossman, Applications Chemist Checking for leaks, using a thermal conductivity leak detector.

Table III: Phase ratio (β) values for common column dimensions.*

	Film Thickness (d_f) / β Value						
Column ID	**0.10 µm**	**0.25 µm**	**0.50 µm**	**1.0 µm**	**1.5 µm**	**3.0 µm**	**5.0 µm**
0.18 mm	450	180	90	45	30	15	9
0.25 mm	625	250	125	63	42	21	13
0.32 mm	800	320	160	80	53	27	16
0.53 mm	1325	530	265	128	88	43	27

*$\beta = r/2d_f$ (r=internal radius of tubing; d_f = phase film thickness)

Efficiency (N)

Column efficiency (N) is the column length divided by the height equivalent of a theoretical plate (HETP). The effective number of theoretical plates is affected by how well the phase has been coated onto the column walls, and it is measured by how narrow the peaks are when they elute out of the column. Higher column efficiency (N) results in greater resolution between peaks. Inner diameter also influences efficiency; a simple rule of thumb is the smaller the column ID, the more efficient the column.

Capillary columns are made in various lengths, typically 10, 15, 30, 60, and 105 meters. Longer columns provide more resolving power, but will also increase analysis time and cost more. When column length is doubled, analysis time will increase by as much as a factor of two. However, doubling the column length increases resolution by only approximately 40% since the column length term is under the square root function in the resolution equation. When selecting column length, the increase in resolution obtained in a longer column must be weighed against the increase in cost and analysis time.

Conclusion

A basic understanding of the resolution equation allows analysts to make more effective column choices. Phase choice should be influenced primarily by separation factor, which can be approximated by considering the structures of both the phase and the analyte, as well as by referencing retention indices or existing applications. Retention factor and efficiency also affect peak separations and should be considered when choosing column inner diameter, film thickness, and length. By better understanding these factors, analysts can simplify the column selection process, optimize separations, and increase lab productivity.

What do the Temperature Limits Mean?

All Restek columns have published minimum and maximum operating temperatures that establish the working range for the stationary phase. Note that these ranges vary with the thickness of the coating.

Rxi®-5Sil MS Columns (fused silica)

ID	d_f (µm)	temp. limits
0.25 mm	0.25	-60 to 320/350 °C
0.32 mm	0.50	-60 to 320/350 °C
0.53 mm	1.50	-60 to 320/330 °C

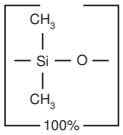
The second temperature is the **maximum temperature-programmed operating temperature**, the temperature to which the column can be heated for short periods of time (i.e., during a temperature-programmed analysis). If only one temperature is listed, it is both the isothermal and the maximum temperature.

The **minimum operating temperature** defines the lowest usable temperature before the stationary phase solidifies. Operating the column below the minimum temperature will not harm the phase, but poor peak shape and other chromatography problems may occur.

Many phases list two maximum operating temperatures. The first temperature is the **maximum isothermal operating temperature**. This is the temperature to which the columns are guaranteed to meet the minimum bleed specification (i.e., lowest bleed level).

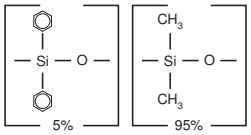
Structures, polarities, properties, and uses for Restek capillary column phases, in order of increasing polarity

Rxi®-1ms, Rxi®-1HT, Rtx®-1
Dimethyl polysiloxane



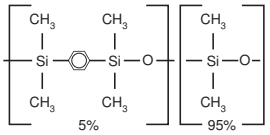
Similar to: (100%-methyl)-polysiloxane
Polarity: nonpolar
Uses: solvents, petroleum products, pharmaceutical samples, waxes
[G1]

Rxi®-5ms, , Rxi®-5HT, Rtx®-5, Rtx®-5MS
Diphenyl dimethyl polysiloxane



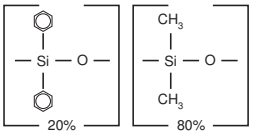
Similar to: (5%-phenyl)-methylpolysiloxane
Polarity: slightly polar
Uses: flavors, environmental, aromatic hydrocarbons
[G27]

Rxi®-5Sil MS
1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane



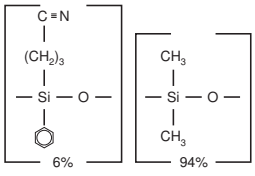
Similar to: (5%-phenyl)-methylpolysiloxane
Polarity: slightly polar
Uses: flavors, environmental, pesticides, PCBs, aromatic hydrocarbons

Rtx®-20
Diphenyl dimethyl polysiloxane



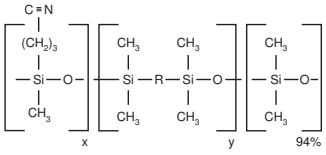
Similar to: (20%-phenyl)-methylpolysiloxane
Polarity: slightly polar
Uses: volatile compounds, alcohols
[G32]

Rtx®-1301, Rtx®-624, Rtx®-G43
Cyanopropylphenyl dimethyl polysiloxane



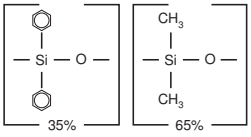
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: volatile compounds, insecticides
[G43]

Rxi®-624Sil MS



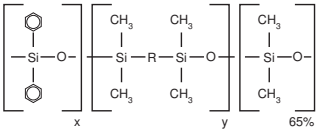
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products

Rtx®-35
Diphenyl dimethyl polysiloxane



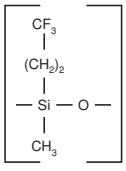
Similar to: (35%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides
[G42]

Rxi®-35Sil MS



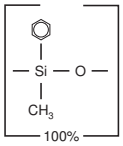
Similar to: (35%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides

Rtx®-200
Trifluoropropylmethyl polysiloxane



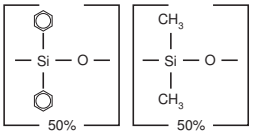
Similar to: (trifluoropropyl)-methylpolysiloxane
Polarity: selective for lone pair electrons
Uses: environmental, solvents, Freon® gases, drugs, ketones, alcohols
[G6]

Rtx®-50
Phenyl methyl polysiloxane



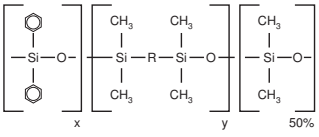
Similar to: (50%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: FAMEs, carbohydrates
[G3]

Rxi®-17
Diphenyl dimethyl polysiloxane



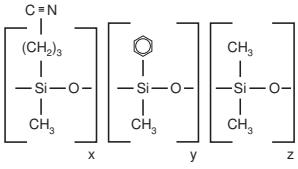
Similar to: (50%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols
[G3]

Rxi®-17Sil MS



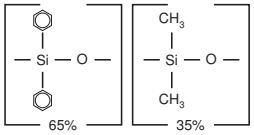
Similar to: (50%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols

Rtx®-1701



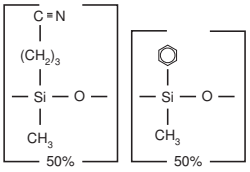
Similar to: (14%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, alcohols, oxygenates
[G46]

Rtx®-65, Rtx®-65TG
Diphenyl dimethyl polysiloxane



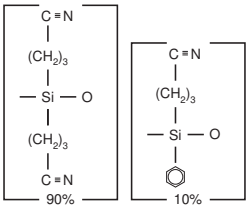
Similar to: (65%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: triglycerides, rosin acids, free fatty acids

Rtx®-225
Cyanopropylmethyl phenylmethyl polysiloxane



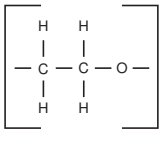
Similar to: (50%-cyanopropylmethyl)-methylphenylpolysiloxane
Polarity: polar
Uses: FAMEs, carbohydrates
[G7]

Rtx®-2330
Biscyanopropyl cyanopropylphenyl polysiloxane



Similar to: (95%-cyanopropyl)-phenyl polysiloxane
Polarity: polar
Uses: *cis/trans* FAMEs, dioxin isomers, rosin acids
[G48]

Stabilwax®, Rtx®-Wax
Polyethylene glycol



Polarity: polar
Uses: FAMEs, flavors, acids, amines, solvents, xylene isomers
[G16]

note

Structures, polarities, and properties also apply to metal MXT® stationary phases.

Columns by Phase

Restek	Phase Composition	USP Nomenclature*	Agilent	SGE	Phenomenex	Macherey-Nagel	Supelco	Alltech	Quadrex
Rtx-1 (p. 39) MXT-1 (p. 93)	dimethyl polysiloxane	G1, G2, G38	HP-1, DB-1, CP Sil 5 CB	BP1	ZB-1	OPTIMA 1	SPB-1	007-1AT-1, EC-1	007-1
Rxi-1HT (p. 37)	dimethyl polysiloxane		DB-1ht		ZB-1HTinferno			AT-1ht	
Rxi-1ms (p. 31)	dimethyl polysiloxane (low bleed)		HP-1, HP-1ms, HP-1msUI, DB-1, DB-1ms, DB-1msUI, Ultra-1, VF-1ms, CP-Sil 5 CB	BP1	ZB-1, ZB-1ms	OPTIMA 1 MS, OPTIMA 1 MS Accent	SPB-1, Equity-1	AT-1ms	007-1
Rtx-5 (p. 40) MXT-5 (p. 94)	diphenyl dimethyl polysiloxane	G27, G36	HP-5, DB-5, CP Sil 8 CB	BP5	ZB-5	OPTIMA 5	SPB-5	EC-5, AT-5	007-5
Rxi-5HT (p. 37)	diphenyl dimethyl polysiloxane		DB-5ht, VF-5ht	HT5	ZB-5HTinferno	OPTIMA 5HT			
Rxi-5ms (p. 31)	diphenyl dimethyl polysiloxane (low bleed)	G27, G36	HP-5, HP-5ms, DB-5, Ultra-2, CP-Sil 8 CB	BP5ms	ZB-5, ZB-5ms	OPTIMA 5, OPTIMA 5 MS	SPB-5, Equity-5	AT-5ms	007-5
Rxi-5Sil MS (p. 32, 57, 64, 66, 73)	1,4-bis(dimethylsiloxy)phenyl- ene dimethyl polysiloxane		DB-5ms, DB-5msUI, VF-5ms, CP-Sil 8 CB	BPX5	ZB-5msi	OPTIMA 5MS Accent	SLB-5ms		007-5MS
Rxi-XLB (p. 34, 60)	unique phase		DB-XLB, VF-XMS		MR1, ZB-XLB	OPTIMA XLB			
Rtx-20 (p. 41) MXT-20 (p. 94)	diphenyl dimethyl polysiloxane	G28, G32					SPB-20	EC-20, AT-20	007-20
Rtx-35 (p. 41) MXT-35 (p. 95)	diphenyl dimethyl polysiloxane	G42	HP-35, DB-35	BPX35, BPX608	ZB-35		SPB-35, SPB-608	AT-35, AT-35ms	007-35
Rxi-35Sil MS (p. 34)	unique phase		DB-35ms, DB35msUI, VF-35ms	BPX35	MR2	OPTIMA 35 MS			
Rtx-50 (p. 42) MXT-50 (p. 95)	phenyl methyl polysiloxane	G3					SPB-50	AT-50	007-17
Rxi-17 (p. 34)	diphenyl dimethyl polysiloxane		HP-50+, DB-17, DB-17ht, DB-608, CP-Sil 24 CB		ZB-50	OPTIMA 17	SPB-17		
Rxi-17Sil MS (p. 35, 65)	unique phase		DB-17ms, VF-17ms, CP-Sil 24 CB	BPX50	ZB-50	OPTIMA 17 MS			
Rtx-65 (p. 42) MXT-65 (p. 95)	diphenyl dimethyl polysiloxane	G17							007-65HT
Rxi-624Sil MS (p. 36, 70, 80)	unique phase		DB-624, VF-624ms, CP-Select 624 CB	BP624	ZB-624	OPTIMA 624 LB			
Rtx-1301 (p. 45) Rtx-624 (p. 45) MXT-1301 (p. 95)	cyanopropylphenyl dimethyl polysiloxane	G43	DB-1301, DB-624, VF-1301ms, VF-624ms, CP-1301	BP624	ZB-624	OPTIMA 1301, OPTIMA 624	SPB-624	AT-624, AT-1301	007-1301, 007-624
Rtx-1701 (p. 46) MXT-1701 (p. 96)	cyanopropylphenyl dimethyl polysiloxane	G46	DB-1701R, DB-1701, CP Sil 19 CB, VF-1701ms, VF-1701 Pesticides	BP10	ZB-1701, ZB-1701P	OPTIMA 1701	Equity-1701	AT-1701	007-1701
Rtx-200 (p. 44) MXT-200 (p. 96)	trifluoropropylmethyl polysiloxane	G6	DB-210, DB-200, VF-200ms			OPTIMA 210		AT-210	
Rtx-200MS (p. 44)	trifluoropropylmethyl polysiloxane (low bleed)		VF-200ms						
Rtx-225 (p. 46)	cyanopropylmethyl phenylmethyl polysiloxane	G7, G19	DB-225ms, CP Sil 43 CB	BP225		OPTIMA 225	SPB-225	AT-225	007-225
Rtx-440 (p. 43)	unique phase		**Restek innovation**						
Rtx-2330 (p. 47)	biscyanopropyl cyanopropylphenyl polysiloxane	G48	VF-23ms	BPX70			SP-2330, SP-2331, SP-2380	AT-Silar90	007-23
Rt-2560 (p. 47, 71)	bicyanopropyl polysiloxane		HP-88, CP Sil 88				SP-2560		
Rtx-Wax (p. 48)	polyethylene glycol	G14, G15, G16, G20, G39	DB-Wax, CP Wax 52 CB	BP20	ZB-Wax	OPTIMA WAX		AT-WAXms, EC-WAX	007-CW
Stabilwax (p. 49, 81) MXT-WAX (p. 96)	polyethylene glycol	G14, G15, G16, G20, G39	HP-INNOWax, CP Wax 52 CB, VF-WAX MS		ZB-WAXplus	OPTIMA WAXplus	Supelcowax-10	AT-WAX	

See page 103 for Restek PLOT Column Phase Cross-Reference chart.

*See page 131 for our USP Liquid Phase and Solid Support Cross-Reference.

Columns by Application/Industry

Restek	Applications	Agilent	Supelco	Macherey-Nagel	SGE	Alltech	Phenomenex
Chiral Columns							
Rt-βDEXm, Rt-βDEXsm, Rt-βDEXse, Rt-βDEXsp, Rt-βDEXsa, Rt-βDEXcst, Rt-γDEXsa (p. 89)	Chiral compounds						
Clinical, Forensic, & Toxicology							
Rtx-BAC Plus 1 (p. 55)	Blood alcohol testing	DB-ALC1					ZB-BAC1
Rtx-BAC Plus 2 (p. 55)		DB-ALC2					ZB-BAC2
Environmental							
Rxi-5Sil MS (p. 57, 64, 66)	Semivolatiles - EPA Methods 8270, 625, 525	DB-5ms, DB-5msUI, VF-5ms, CP-Sil 8 CB	SLB-5ms	OPTIMA 5MS Accent	BPX5		ZB-5msi
Rtx-VMS (p. 67)	Volatiles - EPA Methods 8260, 624, 524	Restek innovation					
Rxi-624Sil MS (p. 70)	Volatiles - EPA Method 624	DB-624, VF-624ms, CP-Select 624 CB		OPTIMA 624 LB	BP624		ZB-624
Rtx-502.2 (p. 69)	Volatiles - EPA Methods 8010, 8020, 502.2, 601, 602	DB-502.2	VOCOL			AT-502.2	
Rtx-Volatiles (p. 69)			VOCOL				
Rtx-VRX (p. 68)		DB-VRX					
Rtx-CLPesticides (p. 62)	Organochlorine pesticides - EPA Methods 8081, 8082, 608, 505, 508	DB-CLP1					
Rtx-CLPesticides2 (p. 62)		DB-CLP2					
Rtx-1614 (p. 56)	Brominated flame retardants	Restek innovation					
Rtx-PCB (p. 59)	Polychlorinated biphenyl - EPA Methods 8082, 608, PCB congeners	Restek innovation					
Rxi-XLB (p. 60)		DB-XLB, VF-XMS					MR1, ZB-XLB
Rtx-OPPesticides (p. 61)	Organophosphorus pesticides - EPA Method 8141	Restek innovation					
Rtx-OPPesticides2 (p. 61)		Restek innovation					
Rtx-Dioxin2 (p. 58)	Dioxin & Furans - EPA Methods	Restek innovation					
Rxi-17Sil MS (p. 65)	Polycyclic aromatic hydrocarbons	DB-17ms, VF-17ms, CP-Sil 24 CB		OPTIMA 17 MS	BPX50		ZB-50
Foods, Flavors, & Fragrances							
Rt-2560 (p. 71)	*cis*/*trans* FAMEs	HP-88	SPB-2560				
FAMEWAX (p. 71)	Marine oils	Select FAME	Omegawax			AT-AquaWax, AT-FAME	
Rxi-PAH (p. 72)	PAHs	Restek innovation					
Rtx-65 TG (p. 74)	Triglycerides	Restek innovation					
Petroleum & Petrochemical							
Rt-Alumina BOND/CFC (p. 108)	Chlorinated fluorocarbons (CFCs)						
Rtx-DHA (p. 77)	Detailed hydrocarbon analysis	HP-PONA, DB-Petro, CP Sil PONA CB	Petrocol DH		BP1PONA		
Rtx-2887 (p. 79) MXT-2887 (p. 99)	Hydrocarbons - ASTM 2887	DB-2887	Petrocol 2887, Petrocol EX2887			AT-2887	
D3606 (p. 121)	Ethanol - ASTM 3606	Restek innovation					
Rt-TCEP (p. 75)		CP-TCEP	TCEP				
Rtx-Mineral Oil (p. 78)	DIN ENISO 9377-2	Select Mineral Oil	Select Mineral Oil	Select Mineral Oil	Select Mineral Oil		
MXT-1HT SimDist (p. 100)	Simulated distillation	DB-HT-SimDis, CP-SimDist, CP-SimDst Ultimetal			BPX1	AT-3710	ZB-1XT SimDist
MXT-1 SimDist (p. 101)		DB-HT-SimDis, CP-SimDist, CP-SimDst Ultimetal	CP-SIMDIST	CP-SIMDIST	CP-SIMDIST		
MXT-500 SimDist (p. 101)		Restek innovation					
Rtx-Biodiesel TG (p. 76) MXT-Biodiesel TG (p. 99)	Triglycerides in biodiesel	Biodiesel, Select Biodiesel		OPTIMA Biodiesel			ZB-Bioethanol
Pharmaceutical							
Rtx-G27 w/IntegraGuard (p. 83)	Organic volatile impurities (OVI) - USP 467						
Rtx-G43 w/IntegraGuard (p. 83)			OVI-G43				
Rxi-624Sil MS (p. 80)		DB-624, VF-624ms, CP-Select 624 CB		OPTIMA 624 LB	BP624		ZB-624
Rtx-5 (G27) (p. 83)		HP-5, DB-5, CP Sil 8 CB	SPB-5	OPTIMA 5	BP5	EC-5, AT-5	ZB-5
Stabilwax (G16) (p. 81)		HP-INNOWax, CP Wax 52 CB, VF-WAX MS	Supelcowax-10	OPTIMA WAXplus		AT-WAX	ZB-WAXplus
Specially deactivated phases							
Rtx-Volatile Amine (p. 85)	Volatile amines	CP-VolAmine					
Rtx-5Amine (p. 86)	Amines	CP-Sil 8 CB		OPTIMA 5 Amine			
Rtx-35Amine (p. 87)		Restek innovation					
Stabilwax-DB (p. 88)		CAM, CP WAX 51	Carbowax Amine	FS-CW 20 M-AM		AT-CAM	
Stabilwax-DA (p. 84)	Free fatty acids	HP-FFAP, DB-FFAP, VF-DA, CP WAX58 CB, CP-FFAP CB	Nukol	PERMABOND FFAP, OPTIMA FFAP, OPTIMA FFAP Plus	BP-21	AT-AquaWax DA, AT-1000	ZB-FFAP

did you know?

We test our guard columns/ transfer lines with a comprehensive test mix to ensure high inertness.

please note

Having trouble making a leak-free connection? Try our "built in" Integra-Guard® columns!

See page 25 for details.

Guard Columns and Retention Gaps

Guard columns and retention gaps are widely used in gas chromatography. The concept of the guard column is to trap nonvolatile material at the head of the column, not allowing the material to reach the analytical column. The concept of the retention gap is to help focus the compounds transferred from the inlet to a small band at the head of the analytical column in order to reduce chromatographic peak broadening. Both concepts (trapping nonvolatile material and refocusing the target analytes) may take place when a piece of deactivated tubing is connected to an analytical column as in Figure 1.

Figure 1 A guard/retention gap column connected to an analytical column

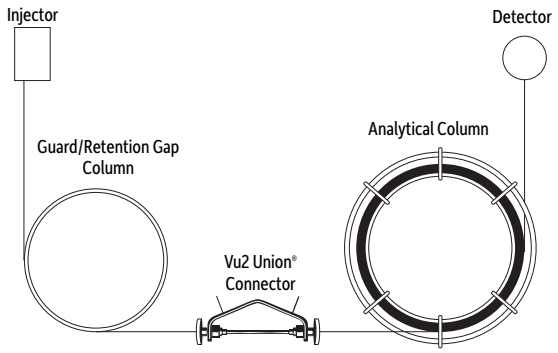


Figure 2 Retention gaps are used to focus components in a tight band at the beginning of the analytical column.

a) Sample introduction: a liquid film of solvent and sample is deposited in the first length of capillary.

b) As oven temperature increases, the solvent evaporates and the target compounds elute unretained through the retention gap until they contact the analytical column.

c) When target compounds come in contact with the stationary phase, they are refocused on the analytical column, resulting in a narrow initial band width.

Analyte Focusing

There are two injection techniques where the retention gap is used to help focus target analytes at the beginning of the analytical column: cool on-column injection and splitless injection.

For cool on-column injection, the purpose of a retention gap is to help focus the sample components when introducing a liquid sample directly into the retention gap. The cool on-column injection is performed by inserting the syringe needle into the retention gap (this can be accomplished with a 0.53 mm ID retention gap and a 26s gauge syringe) and transferring the liquid sample directly into the retention gap. The injection is made with the injector and column oven set below the boiling point of the solvent. As the solvent is evaporated, the volatile target analytes migrate in the solvent towards the analytical column, and the heavier analytes will be distributed over the retention gap. As the oven temperature increases, the target analytes vaporize and move unretained down the retention gap column until the compounds reach the liquid stationary phase of the analytical column. At this juncture, the target analytes are trapped/focused by the liquid phase forming a narrow injection band.

The retention gap may also be useful in hot vaporization injections when the transfer of the compounds from the inlet to the column does not form a focused band. Typical applications include water injections or injections using small ID columns, where split or tailing peaks would indicate an unfocused band. In these applications, the target analytes are trapped in a nonuniform or longitudinally diffuse band at the head of the retention gap (Figure 2a). As the oven temperature is increased, the solvent and target compounds are vaporized and move unretained through the retention gap (Figure 2b). When the target compounds come in contact with the stationary phase, they are refocused in a narrow band (Figure 2c), improving the chromatography.

Protecting the Analytical Column

The concept of a guard column is to protect the analytical column from becoming contaminated with nonvolatile compounds. The guard column is used to retain nonvolatile material, usually in the first 10-20 cm, and not allow it to elute onto the liquid phase of the analytical column. As the oven temperature increases, the more volatile target compounds vaporize, elute down the guard column, and refocus at the head of the analytical column without interference from the nonvolatile material left behind.

Using guard columns is advantageous, because they prevent contamination from being introduced onto the column. Contaminants can cause active sites as well as change the conditions of the focusing zone of the analytical column. Another advantage is that the resolution of closely eluting compounds will not be affected when the column is trimmed during maintenance because the guard column does not contribute to the resolving power of the analytical column. Using guard columns is a simple, cost-effective way to extend analytical column lifetime.

In summary, the retention gap and guard column are essentially the same products, but are used for different purposes. The deactivated tubing provides an inert pathway, helps focus target analytes at the head of the analytical column for on-column and splitless injections, and also prevents nonvolatile material from contaminating the head of the analytical column.

What type of guard column should be used?

When using a guard column, it is important to match the polarity of the solvent and the polarity of the surface deactivation. Rxi® guard tubing is good for a wide variety of applications and allows most common solvents (methylene chloride, hexane, isooctane, toluene) to easily wet and create a uniform film on the tubing surface.

If more polar solvents such as methanol or water are used, a polar-deactivated guard column is recommended to allow the solvent to wet the tubing surface. However, polar-deactivated guard columns are not resistant to harsh "water vaporization," which occurs when water in the liquid state is injected into the tubing and rapidly vaporizes (such as in steam cleaning). Hydroguard® deactivation is an alternative for direct aqueous injections. However, a Hydroguard®-deactivated guard column will not allow polar solvents to wet the tubing surface, and may cause solvent beading if the oven temperature is 20 °C below the solvent boiling point. Base-deactivated guard columns reduce adsorption and tailing for amines and other basic compounds.

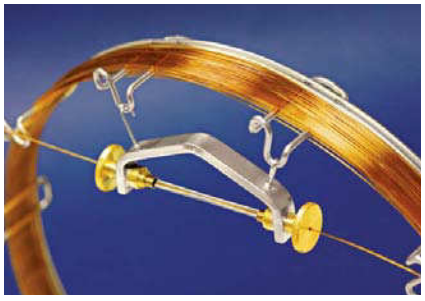
How is a guard column connected to the analytical column?

To connect the guard column to the analytical column, Vu2-Union®, Press-Tight®, and other connectors are available. MXT® unions, typically used for connecting metal columns together, are now available for fused silica columns. See pages 208 to 214 for information about these connectors.

it's a fact

To eliminate connections that may leak and to ensure longer column lifetime, use our unique Integra-Guard® column. See **page 25**.

Connectors for Fused Silica Columns



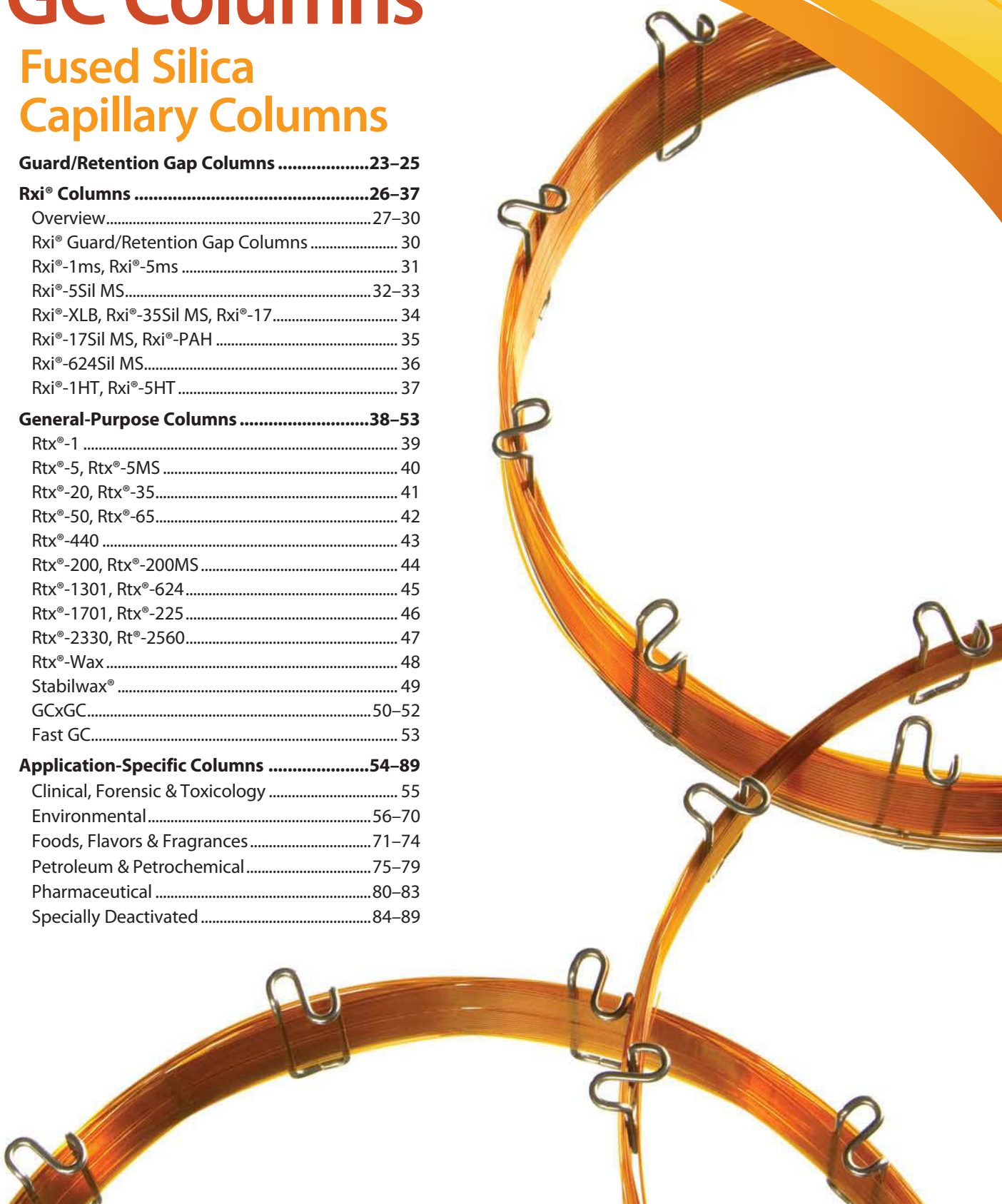
Vu2 Union® Connector
(See page 210.)

Press-Tight® Connectors
(See pages 208–209.)

MXT® Union Connector Kit
for Fused Silica
(See page 212.)

GC Columns

Fused Silica Capillary Columns



Rxi® Guard/Retention Gap Columns (fused silica)

- Extend column lifetime.
- Excellent inertness—obtain lower detection limits for active compounds.
- Sharper chromatographic peaks by utilizing retention gap technology.
- Maximum temperature: 360 °C.

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter	10-Meter/6-pk.
0.25 mm	0.37 ± 0.04 mm	10029	10029-600	10059	10059-600
0.32 mm	0.45 ± 0.04 mm	10039	10039-600	10064	10064-600
0.53 mm	0.69 ± 0.05 mm	10054	10054-600	10073	10073-600

Intermediate-Polarity Deactivated Guard/Retention Gap Columns/ Transfer Lines (fused silica)

- Tested with a comprehensive test mix to ensure high inertness.
- Useful for a wide range of applications.
- Use with most common solvents.
- Maximum temperature: 325 °C

Nominal ID	Nominal OD	1-Meter	5-Meter	5-Meter/6-pk.
0.025 mm	0.363 ± 0.012 mm	10097		
0.05 mm	0.363 ± 0.012 mm	10098		
0.075 mm	0.363 ± 0.012 mm	10099		
0.10 mm	0.363 ± 0.012 mm	10100	10041	
0.15 mm	0.363 ± 0.012 mm	10101	10042	
0.18 mm	0.37 ± 0.04 mm	10102	10046	10046-600
0.25 mm	0.37 ± 0.04 mm		10043	10043-600
0.32 mm	0.45 ± 0.04 mm		10044	10044-600
0.53 mm	0.69 ± 0.05 mm		10045	10045-600

Nominal ID	Nominal OD	10-Meter	10-Meter/6-pk.	30-Meter*	60-Meter*†
0.25 mm	0.37 ± 0.04 mm	10049	10049-600	10012	10013
0.32 mm	0.45 ± 0.04 mm	10048	10048-600	10022	10023
0.53 mm	0.69 ± 0.05 mm	10047		10032	10033

*30- and 60-meter lengths are banded in 5-meter sections.
†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

Polar-Deactivated Guard/Retention Gap Columns (fused silica)

(polar polyethylene glycol deactivation)

- Tested with a comprehensive test mix to ensure high inertness.
- Polyethylene glycol deactivation layer provides optimum wettability for polar compounds.
- Minimize peak splitting when using polar solvents such as methanol or water.
- Compatible with Stabilwax®, Rtx®-225, and Rt®-2330 capillary columns.
- Maximum temperature: 280 °C.

Nominal ID	Nominal OD	5-Meter	10-Meter	30-Meter*	60-Meter*†
0.25 mm	0.37 ± 0.04 mm	10065	10068	10014	10015
0.32 mm	0.45 ± 0.04 mm	10066	10069		
0.53 mm	0.69 ± 0.05 mm	10067	10070	10034	

*30- and 60-meter lengths are banded in 5-meter sections.
†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

it's a fact

To eliminate connections, use an Integra-Guard® column. See **page 25**.

also available

Metal MXT® Guard/ Retention Gap Columns

Rugged, flexible, Siltek®-treated stainless steel tubing for use with MXT® columns; inertness comparable to fused silica tubing.

See **page 92.**

it's a fact

Use guard columns to:

- Reduce effects of dirty samples on column performance.
- Reduce downtime and maintenance.

did you know?

Fused silica guard columns are held together in a band with high temperature string that can withstand normal column operating temperatures. To prevent the tubing from coming unwound, do not remove the string!

Fused Silica, PLOT, & MXT® Capillary GC Column Ferrule Guide

GC Column ID	Ferrule ID
0.10 mm	0.4
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.28 mm	0.4
0.32 mm	0.5
0.45 mm	0.8
0.53 mm	0.8

also available

Base-deactivated inlet liners
See **page 185**.

did you know?

We test our guard columns/transfer lines with a comprehensive test mix to ensure high inertness.

also available

Metal MXT® Guard/ Retention Gap Columns

Rugged, flexible, Siltek®-treated stainless steel tubing for use with MXT® columns; inertness comparable to fused silica tubing.

See **page 92.**

Base-Deactivated Guard/Retention Gap Columns (fused silica)

- Tested with a basic amine test mix.
- Excellent inertness for basic compounds.
- Recommended for use with Rtx®-5 Amine, Rtx®-35 Amine, Rtx®-Volatile Amine, and Stabilwax®-DB capillary columns.
- Batch test chromatogram included.
- Maximum temperature: 315 °C.

Chemists using guard columns in the analyses of basic compounds frequently observe peak tailing and low recovery. This happens because conventionally deactivated tubing surfaces can be adsorptive to basic compounds. Restek offers base-deactivated guard columns, as well as base-deactivated inlet liners, for completely inert sample pathways.

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.
0.25 mm	0.37 ± 0.04 mm	10000	10000-600
0.32 mm	0.45 ± 0.04 mm	10001	10001-600
0.53 mm	0.69 ± 0.05 mm	10002	10002-600

Hydroguard® Water-Resistant Guard/Retention Gap Columns/ Transfer Lines (fused silica)

- Extend analytical column lifetime by preventing degradation from harsh "steam-cleaning" water injections.
- Tested with a comprehensive test mix, to ensure high inertness.
- Maximum temperature: 325 °C.

When transfer lines from purge-and-trap systems, air monitoring equipment, or other instruments carry condensed water vapor, deactivated column tubing quickly becomes active because of the creation of free silanol groups. These silanol groups adsorb active oxygenated compounds, such as alcohols and diols.

Restek chemists have addressed this concern and found a solution—Hydroguard® deactivated tubing. A unique deactivation chemistry creates a high-density surface that is not readily attacked by aggressive hydrolysis. The high-density surface coverage of the Hydroguard® deactivation layer effectively prevents water vapor from reaching the fused silica surface beneath. Use Hydroguard® tubing for connecting GCs to:

- Headspace analyzers.
- Air analysis equipment and concentrator units.
- Purge-and-trap systems.

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter	30-Meter*	60-Meter*†
0.05 mm	0.363 ± 0.012 mm	10075				
0.10 mm	0.363 ± 0.012 mm	10076				
0.15 mm	0.363 ± 0.012 mm	10077				
0.18 mm	0.37 ± 0.04 mm	10078				
0.25 mm	0.37 ± 0.04 mm	10079	10079-600	10082	10085	
0.32 mm	0.45 ± 0.04 mm	10080	10080-600	10083	10086	
0.53 mm	0.69 ± 0.05 mm	10081	10081-600	10084	10087	10090

*30- and 60-meter lengths are banded in 5-meter sections.
†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

also available

Column connector kits & ferrules

See **page 213.**

Innovative Integra-Guard® Columns

Get the protection without the connection!

- No leaks for a more robust method.
- No column connections for easier, faster maintenance.
- No peak distortions due to connector dead volume and thermal capacity.

For analysts who find it inconvenient to make a leak-free connection between the guard column and the analytical column, we offer Integra-Guard® columns. These innovative columns incorporate both guard column and analytical column in a continuous length of tubing, eliminating the connection and all connection-associated problems! The guard column section is marked separately from the analytical column, using high-temperature string.

A wide variety of our Integra-Guard® capillary columns are listed here. The Integra-Guard® column is so economical that we challenge you to compare our price against that of a conventional connection, even if you assemble it yourself. If you are currently using a guard column, or are considering using one, call today and ask about Integra-Guard® columns.

Description	qty.	cat.#
Rtx-1		
30 m, 0.25 mm ID, 0.25 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10123-124
30 m, 0.53 mm ID, 1.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10155-126
30 m, 0.53 mm ID, 5.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10179-126
Rtx-5		
30 m, 0.25 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10223-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5 w/10 m Integra-Guard Column	ea.	10223-127
30 m, 0.25 mm ID, 1.00 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10253-124
30 m, 0.32 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10224-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10254-125
30 m, 0.53 mm ID, 5.00 µm Rtx-5/Rtx-G27 w/5 m Integra-Guard Column	ea.	10279-126
60 m, 0.32 mm ID, 0.25 µm Rtx-5 w/5 m Integra-Guard Column	ea.	10227-125
Rtx-5MS		
15 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12620-124
15 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12635-127
30 m, 0.25 mm ID, 0.10 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12608-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12623-124
30 m, 0.25 mm ID, 0.25 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12623-127
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12638-124
30 m, 0.25 mm ID, 0.50 µm Rtx-5MS w/10 m Integra-Guard Column	ea.	12638-127
30 m, 0.32 mm ID, 0.25 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12624-125
30 m, 0.32 mm ID, 1.00 µm Rtx-5MS w/5 m Integra-Guard Column	ea.	12654-125
Rxi-5Sil MS		
15 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13620-127
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13623-127
15 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13635-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13638-127
30 m, 0.32 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13639-125
30 m, 0.32 mm ID, 1.00 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13654-125
Rtx-624		
30 m, 0.25 mm ID, 1.40 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10968-124
30 m, 0.32 mm ID, 1.80 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10970-125
30 m, 0.53 mm ID, 3.00 µm Rtx-624 w/5 m Integra-Guard Column	ea.	10971-126
Rtx-1301		
30 m, 0.53 mm ID, 3.00 µm Rtx-1301 w/5 m Integra-Guard Column	ea.	16085-126
Rtx-1701		
30 m, 0.25 mm ID, 0.25 µm Rtx-1701 w/5 m Integra-Guard Column	ea.	12023-124
Stabilwax		
30 m, 0.25 mm ID, 0.25 µm Stabilwax w/5 m Integra-Guard Column	ea.	10623-124
30 m, 0.32 mm ID, 1.00 µm Stabilwax w/5 m Integra-Guard Column	ea.	10654-125
30 m, 0.53 mm ID, 1.00 µm Stabilwax w/5 m Integra-Guard Column	ea.	10655-126

Integra-Guard® columns are available for all phases listed for columns with 0.25, 0.32 or 0.53 mm ID. If you don't see what you need here, contact Customer Service.

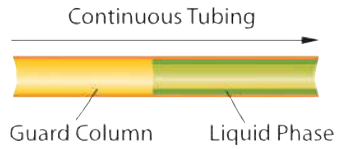
restek innovation!

Integra-Guard® columns: guard columns WITHOUT connections—protecting your analytical column has never been this easy!

similar phases

DuraGuard, EZ-Guard, Guardian

Integra-Guard® Built-In Guard Column



String indicates where the analytical column begins.

Tag indicates guard column end.

Rxi® GC Columns

Rxi® GC Columns

Lower Detection Limits with Ground-Breaking Rxi® Column Technology

Rxi® technology unifies outstanding inertness, low bleed, and high reproducibility into a single high performance column line. Take variation out of the equation and get the most consistent results for trace-level analysis with Rxi® columns.

www.restek.com/rxi

Lower Detection Limits with Ground-Breaking Column Technology

Rxi® columns deliver more accurate, reliable trace-level results than any other fused silica column on the market. To ensure the highest level of performance, all Rxi® capillary columns are manufactured and individually tested to meet stringent requirements for exceptional inertness, low bleed, and unsurpassed column-to-column reproducibility.

Highest Inertness

Inertness is one of the most difficult attributes to achieve in an analytical column, but it is one of the most critical as it improves peak shape, response, and retention time stability. Rxi® technology produces the most inert columns available, providing:

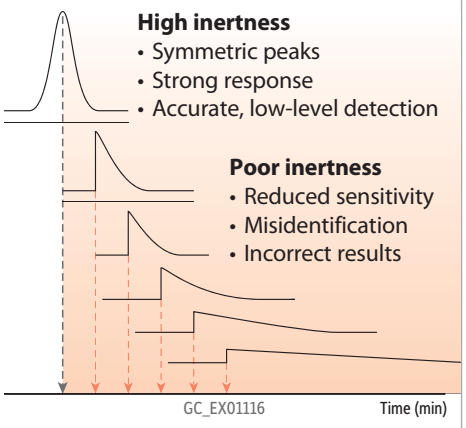
- Increased signal-to-noise ratios to improve low-level detection.
- Reproducible retention times for positive identifications.
- Improved response for polar, acidic, and basic compounds.

Increased Signal and Reproducible Retention Times

When capillaries are not sufficiently deactivated, peaks become asymmetric, resulting in reduced signal and unpredictable retention times. As column activity increases, peak tailing becomes more pronounced, reducing peak height and causing retention time to drift (Figure 1). In practice, this means that sensitivity is lost and trace-level analytes cannot be reliably determined. In addition, even compounds at higher concentrations may be misidentified due to retention time shifting.

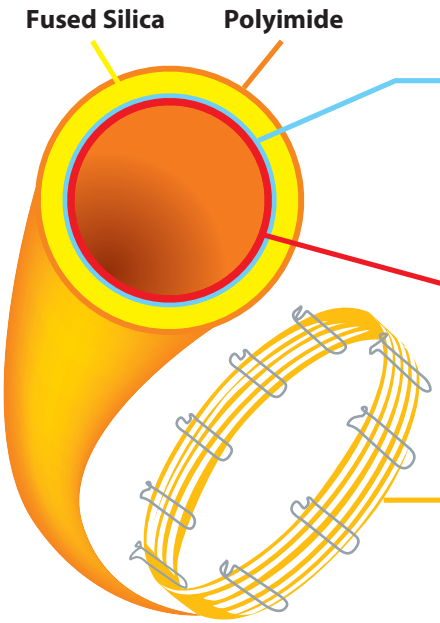
A more significant problem for sample analysis is that retention time can vary with analyte concentration if the column is not highly inert. Since the amount of target analyte in samples is unknown, retention times on a poorly deactivated column can easily vary enough to move compounds outside the retention time window (Figure 2). This can result in inaccurate identifications, the need for manual integration, and additional review or analysis before results can be reported. Using inert Rxi® columns ensures that compounds elute with good signal-to-noise ratios at expected retention times, regardless of analyte concentration.

Figure 1: As column activity increases, signal decreases and retention time shifts.



How did we Create the *Rxi* Column Family?

We've optimized phase chemistry, column deactivation, and our manufacturing process to ensure exceptional performance.

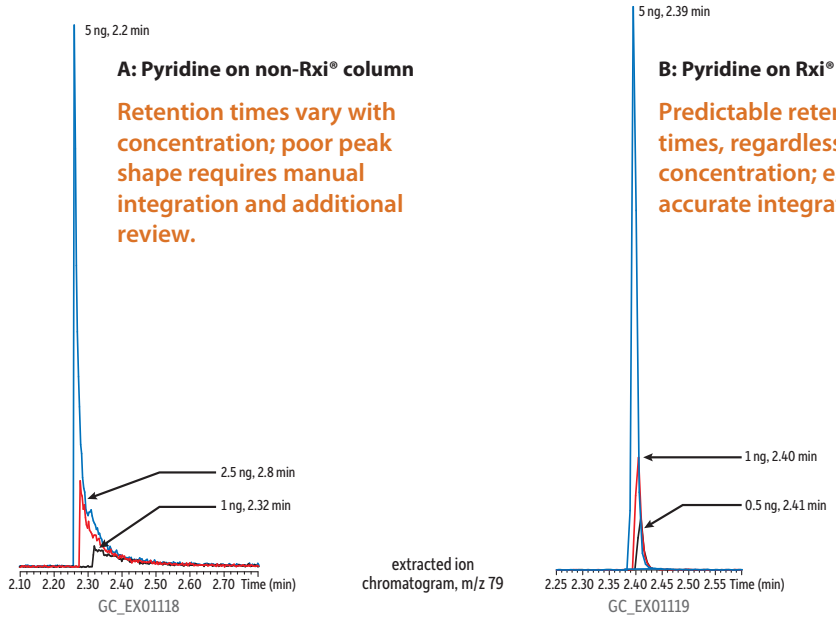


Rxi® Deactivation
- Effectively shields reactive silanols.
- Ensures comprehensive inertness (acids, bases, and diols).
- Provides symmetric peaks for higher sensitivity.

Rxi® Phase Chemistry
- Enhances selectivity for challenging separations.
- Increases thermal stability, widening the application range.
- Lowers bleed for MS compatibility.
- Surface bonding increases durability and ensures reproducible retention times.

Rxi® Manufacturing
Tighter quality controls for better performance and reliable column-to-column reproducibility.

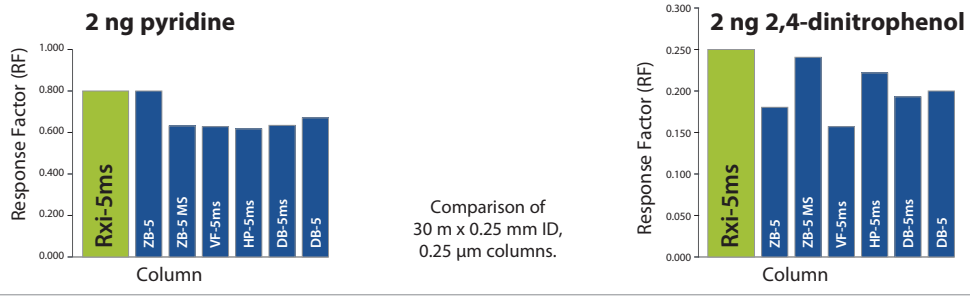
Figure 2: Compared to conventional GC columns, Rxi® columns show excellent inertness and produce good peak shape and reproducible retention for challenging compounds.



Improved Response for Difficult Compounds

Another reason column inertness is important for trace-level analysis is that many acidic, basic, and polar compounds will tail significantly and become difficult to analyze if the column contains active sites. The remarkable neutrality of Rxi® columns solves this problem and allows a wide range of compounds to be analyzed with high sensitivity, often on a single column. All Rxi® columns are exceptionally inert as demonstrated in Figure 3 by high response factors for both pyridine (basic) and 2,4-dinitrophenol (acidic). Rxi® columns reliably produce highly symmetric peaks and improved responses for difficult compounds, indicating greater inertness than columns produced by other manufacturers (Figure 4).

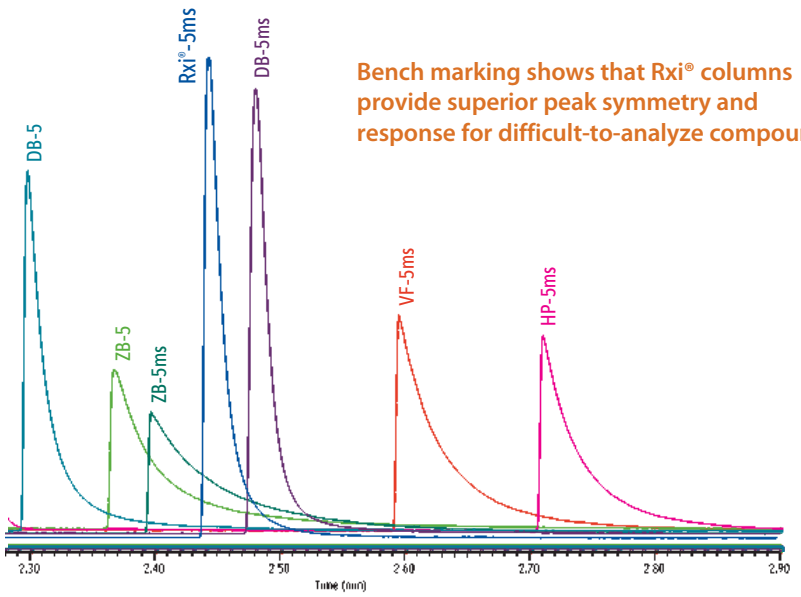
Figure 3: An Rxi® column gives the best overall performance for both basic and acidic compounds.



What are "Sil" Rxi® Columns?

By combining arylene chemistry with Rxi® technology, Restek has developed a subgroup of Rxi® columns with exceptional thermal stability. These columns are produced by incorporating phenylene groups into the polysiloxane backbone, forming silarylene copolymers. As a result of this modification, these columns, which are distinguished by a "Sil" naming convention, have greater thermal stability than their conventional counterparts. Four Sil columns are currently available: Rxi®-5Sil MS, Rxi®-624Sil MS, Rxi®-35Sil MS, and Rxi®-17Sil MS; these columns have the same polarity as their conventional counterparts, but differ in selectivity. Higher thermal stability results in lower bleed, which can make these columns useful for MS applications or when increased sensitivity is required.

Figure 4: Peak shape comparison of a basic compound on various brands of GC columns.



Comparison of 30 m x 0.25 mm ID, 0.25 µm 5% diphenyl columns, 2 ng pyridine on-column, helium carrier gas, Oven temp.: 50 °C (3 min) to 180 °C @ 35 °C/min (5 min), Det.: FID @ 250 °C

Innovation & Service

"When my research group needed a GC column for a chiral separation, Restek was the only company that offered to provide us with test columns to evaluate. The willingness of Restek to work with us to find a solution to our separation problem is exceptional."

Joe Dinnocenzo,
Professor of Chemistry
Director, Center for Photoinduced Charge Transfer
University of Rochester

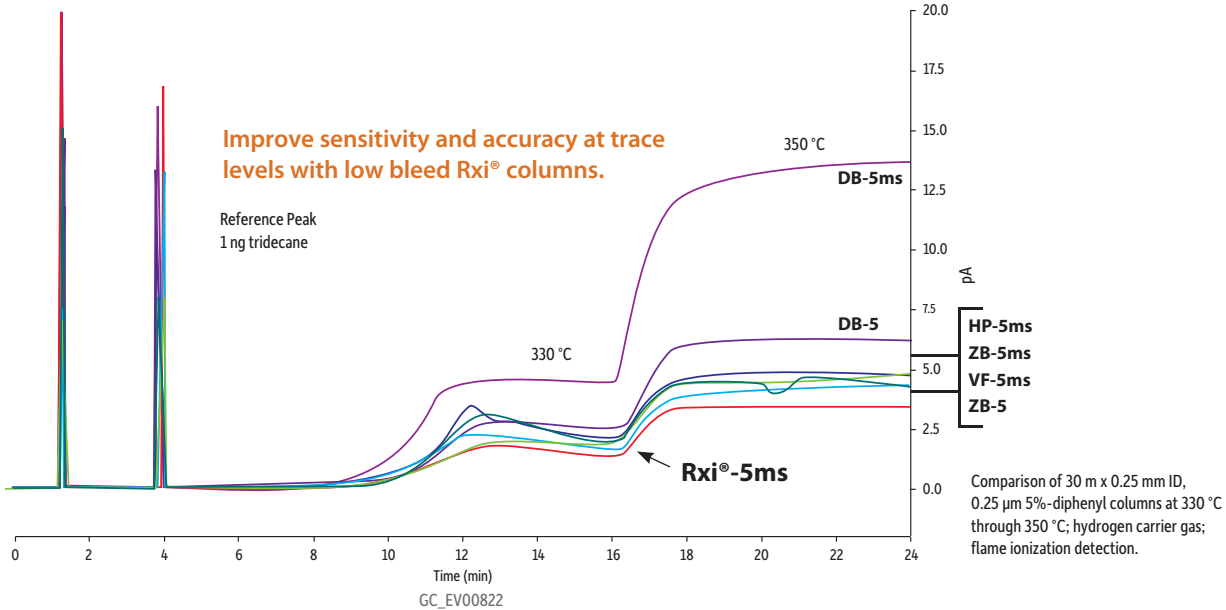
How can we help you today?
Contact support@restek.com or your local Restek representative for helpful, knowledgeable technical support.

Lowest Bleed

Rxi® columns are more stable at high temperatures than any other manufacturer's column, resulting in higher system sensitivity (Figure 5). This low-bleed characteristic is the result of superior stabilization achieved by optimizing polymer cross-linking and surface deactivation technologies. Benefits of using ultra-low bleed Rxi® columns include:

- Increased sensitivity, for lower detection limits and better matches to mass spectral libraries.
- Faster system stabilization.
- Reduced detector contamination results in less downtime for maintenance.

Figure 5: Rxi® columns have the lowest bleed among all major brands of columns.

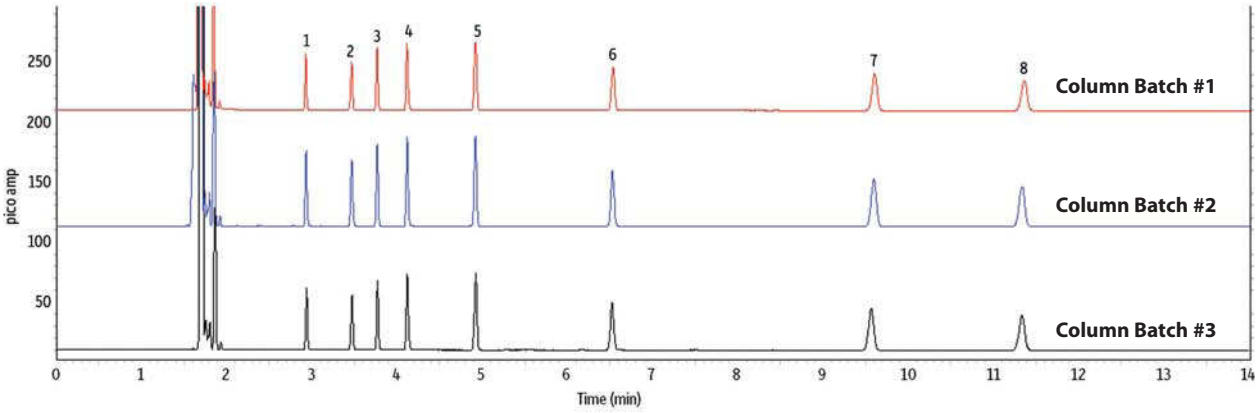


Comparison of 30 m x 0.25 mm ID, 0.25 µm 5%-diphenyl columns at 330 °C through 350 °C; hydrogen carrier gas; flame ionization detection.

Exceptional Reproducibility

Chromatographers today need to know that every column they receive is going to perform the same way as the column it replaces. Unmatched manufacturing precision and stringent quality control mean Rxi® columns exceed industry standards, resulting in the best column-to-column reproducibility available as measured by efficiency, retention, bleed, and inertness (Figure 6).

Figure 6: Rxi® columns are engineered to assure column-to-column and lot-to-lot reproducibility.



GC_EV00819

1. 1,6-Hexanediol
2. 4-Chlorophenol
3. Methyl nonanoate
4. 1-Decylamine
5. Tridecane
6. 1-Undecanol
7. Acenaphthylene
8. Pentadecane

Column	Rxi®-5ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13423)
Sample	Isothermal column test mix
Diluent:	Toluene
Conc.:	500 µg/mL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C

Oven	
Oven Temp.:	135 °C
Carrier Gas	H_2, constant linear velocity
Linear Velocity:	38 cm/sec @ 135 °C
Detector	FID @ 330 °C

Visit **www.restek.com/rxi** for detailed comparisons and to learn how exceptional Rxi® inertness, bleed, and reproducibility can improve your data.

Use **Rxi® Guard/Retention Gap Columns** to protect your analytical column and help focus analytes.

Rxi® Guard/Retention Gap Columns (fused silica)

- Extend column lifetime.
- Excellent inertness—obtain lower detection limits for active compounds.
- Sharper chromatographic peaks by utilizing retention gap technology.
- Maximum temperature: 360 °C.

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter	10-Meter/6-pk.
0.25 mm	0.37 ± 0.04 mm	10029	10029-600	10059	10059-600
0.32 mm	0.45 ± 0.04 mm	10039	10039-600	10064	10064-600
0.53 mm	0.69 ± 0.05 mm	10054	10054-600	10073	10073-600

Rxi®-1ms Columns (fused silica)

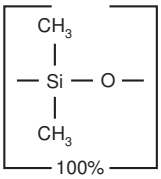
(nonpolar phase; Crossbond® dimethyl polysiloxane)

- General-purpose columns for arson accelerants, essential oils, hydrocarbons, pesticides, PCB congeners (e.g., Aroclor mixes), sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- Temperature range: -60 °C to 330/350 °C (bleed-tested temperature/maximum operating temperature).
- Equivalent to USP G2 phase.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	-60 to 330/350 °C	13320	13323	13326
	0.50 µm	-60 to 330/350 °C	13335	13338	13341
	1.00 µm	-60 to 330/350 °C	13350	13353	13356
0.32 mm	0.25 µm	-60 to 330/350 °C	13321	13324	13327
	0.50 µm	-60 to 330/350 °C	13336	13339	13342
	1.00 µm	-60 to 330/350 °C		13354	13357
	4.00 µm	-60 to 330/350 °C		13396	
0.53 mm	0.50 µm	-60 to 330/350 °C	13337	13340	
	1.00 µm	-60 to 330/350 °C	13352	13355	
	1.50 µm	-60 to 330/350 °C	13367	13370	13373

ID	df	temp. limits	10-Meter	12-Meter	20-Meter	25-Meter	50-Meter
0.15 mm	0.15 µm	-60 to 330/350 °C	43800		43801		
	2.0 µm	-60 to 330/350 °C			43802		
0.18 mm	0.18 µm	-60 to 330/350 °C			13302		
	0.36 µm	-60 to 330/350 °C			13311		
0.20 mm	0.33 µm	-60 to 330/350 °C		13397		13398	13399

Rxi®-1ms Structure



Similar to: (100%-methyl)-polysiloxane

similar phases

HP-1, HP-1ms, HP-1msUI, DB-1, DB-1ms, DB-1msUI, Ultra-1, VF-1ms, CP-Sil 5 CB, ZB-1, ZB-1ms

free literature

Why Derivatize?
Improve GC Separations with Derivatization

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lit. cat.# CFTS1269

Rxi®-5ms Columns (fused silica)

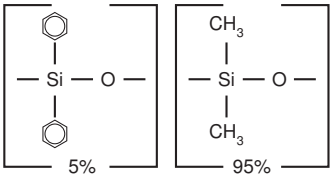
(low polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for semivolatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners (e.g., Aroclor mixes), solvent impurities.
- Most inert column on the market.
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- Temperature range: -60 °C to 330/350 °C (bleed-tested temperature/maximum operating temperature).
- Equivalent to USP G27 phase.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	-60 to 330/350 °C	13420	13423	13426
	0.40 µm	-60 to 330/350 °C		13481	
	0.50 µm	-60 to 330/350 °C	13435	13438	13441
	1.00 µm	-60 to 330/350 °C	13450	13453	13456
0.32 mm	0.25 µm	-60 to 330/350 °C	13421	13424	13427
	0.50 µm	-60 to 330/350 °C	13436	13439	13442
	1.00 µm	-60 to 330/350 °C	13451	13454	13457
0.53 mm	0.25 µm	-60 to 330/350 °C	13422	13425	
	0.50 µm	-60 to 330/350 °C	13437	13440	
	1.00 µm	-60 to 330/350 °C	13452	13455	
	1.50 µm	-60 to 330/350 °C	13467	13470	

ID	df	temp. limits	12-Meter	20-Meter	25-Meter	50-Meter
0.18 mm	0.18 µm	-60 to 330/350 °C		13402		
	0.30 µm	-60 to 330/350 °C		13409		
	0.36 µm	-60 to 330/350 °C		13411		
0.20 mm	0.33 µm	-60 to 330/350 °C	13497		13498	13499

Rxi®-5ms Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

HP-5, HP-5ms, DB-5, Ultra-2, CP-Sil 8 CB, ZB-5, ZB-5ms

free literature

Rxi® Columns
Lower Detection Limits with Ground-Breaking Column Technology

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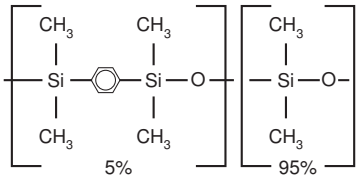
lit. cat.# GNFL1173A

Rxi®-5Sil MS

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, CP-Sil 8 CB, ZB-5msi, Rtx-5Sil MS

free literature

Rxi® Columns
Assured Performance for Forensic Applications

lit. cat.# CFFL1302

Rxi®-5Sil MS Columns
Exceptionally Inert Columns for GC-MS and Trace-Level Analyses

lit. cat.# GNFL1061A

Developing New Methods for Pesticides in Dietary Supplements

lit. cat.# PHAN1242A

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www.restek.com

Rxi®-5Sil MS Columns (fused silica)

(low polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

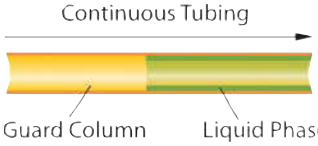
ID	df	temp. limits	10-Meter	20-Meter	40-Meter	60-Meter
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

Rxi®-5Sil MS with Integra-Guard®

- Extend column lifetime.
- Eliminate leaks with a built-in retention gap.
- Inertness verified by isothermal testing.

Description	qty.	cat.#
15 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13620-127
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13623-124
30 m, 0.25 mm ID, 0.25 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13623-127
15 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13635-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13638-124
30 m, 0.25 mm ID, 0.50 µm Rxi-5Sil MS w/10 m Integra-Guard Column	ea.	13638-127
30 m, 0.32 mm ID, 0.50 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13639-125
30 m, 0.32 mm ID, 1.00 µm Rxi-5Sil MS w/5 m Integra-Guard Column	ea.	13654-125

Integra-Guard® Built-In Guard Column



Phases currently available as Integra-Guard® columns

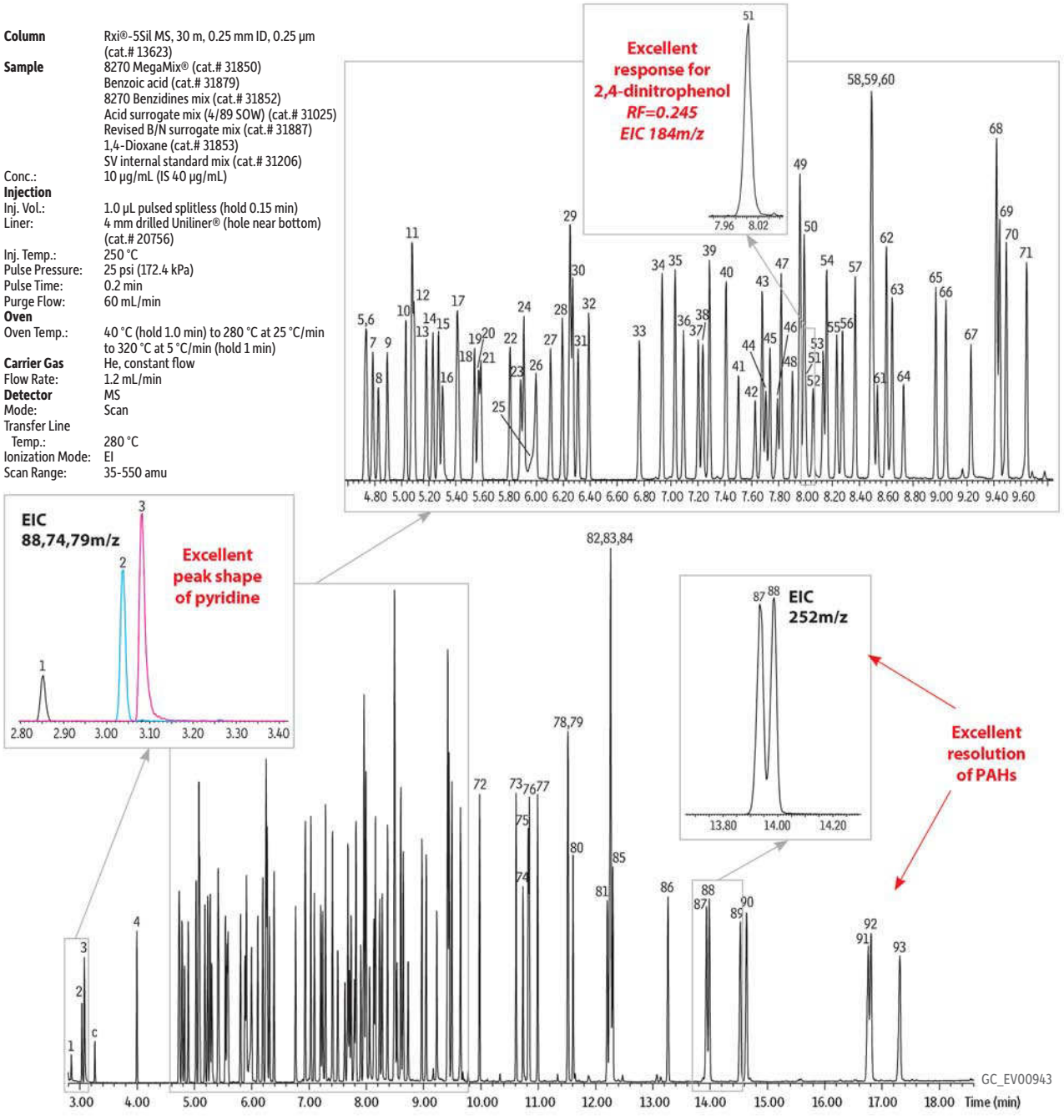
Rtx®-1
Rtx®-5
Rtx®-5MS
Rxi®-5Sil MS
Rtx®-624
Rtx®-1301
Rtx®-1701
Stabilwax®

See page 25 for more information.

Integra-Guard® columns are available for all phases listed for columns with 0.25, 0.32 or 0.53 mm ID. If you don't see what you need here, contact Customer Service.

Semivolatiles by EPA Method 8270 on Rxi®-5Sil MS (30 m, 0.25 mm ID, 0.25 µm) w/Drilled Uniliner® Inlet Liner

Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	8270 MegaMix® (cat.# 31850) Benzoic acid (cat.# 31879) 8270 Benzidines mix (cat.# 31852) Acid surrogate mix (4/89 SOW) (cat.# 31025) Revised B/N surrogate mix (cat.# 31887) 1,4-Dioxane (cat.# 31853) SV internal standard mix (cat.# 31206)
Conc.:	10 µg/mL (IS 40 µg/mL)
Injection	
Inj. Vol.:	1.0 µL pulsed splitless (hold 0.15 min)
Liner:	4 mm drilled Uniliner® (hole near bottom) (cat.# 20756)
Inj. Temp.:	250 °C
Pulse Pressure:	25 psi (172.4 kPa)
Pulse Time:	0.2 min
Purge Flow:	60 mL/min
Oven	
Oven Temp.:	40 °C (hold 1.0 min) to 280 °C at 25 °C/min to 320 °C at 5 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Ionization Mode:	EI
Scan Range:	35-550 amu



Peaks

1. 1,4-Dioxane
2. N-Nitrosodimethylamine
3. Pyridine
4. 2-Fluorophenol (SS)
5. Phenol-d6 (SS)
6. Phenol
7. Aniline
8. Bis(2-chloroethyl) ether
9. 2-Chlorophenol
10. 1,3-Dichlorobenzene
11. 1,4-Dichlorobenzene-d4 (IS)
12. 1,4-Dichlorobenzene
13. Benzyl alcohol
14. 1,2-Dichlorobenzene
15. 2-Methylphenol
16. Bis(2-chloroisopropyl) ether
17. 4-Methylphenol/ 3-methylphenol
18. N-Nitrosodi-N-propylamine
19. Hexachloroethane
20. Nitrobenzene-d5 (SS)
21. Nitrobenzene
22. Isophorone
23. 2-Nitrophenol
24. 2,4-Dimethylphenol
25. Benzoic acid
26. Bis(2-chloroethoxy) methane
27. 2,4-Dichlorophenol
28. 1,2,4-Trichlorobenzene
29. Naphthalene-d8 (IS)
30. Naphthalene
31. 4-Chloroaniline
32. Hexachlorobutadiene
33. 4-Chloro-3-methylphenol
34. 2-Methylnaphthalene
35. 1-Methylnaphthalene
36. Hexachlorocyclo pentadiene
37. 2,4,6-Trichlorophenol
38. 2,4,5-Trichlorophenol
39. 2-Fluorobiphenyl (SS)
40. 2-Chloronaphthalene
41. 2-Nitroaniline
42. 1,4-Dinitrobenzene
43. Dimethyl phthalate
44. 1,3-Dinitrobenzene
45. 2,6-Dinitrotoluene
46. 1,2-Dinitrobenzene
47. Acenaphthylene
48. 3-Nitroaniline
49. Acenaphthene-d10 (IS)
50. Acenaphthene
51. 2,4-Dinitrophenol
52. 4-Nitrophenol
53. 2,4-Dinitrotoluene
54. Dibenzofuran
55. 2,3,5,6-Tetrachlorophenol
56. 2,3,4,6-Tetrachlorophenol
57. Diethyl phthalate
58. 4-Chlorophenyl phenyl ether
59. Fluorene
60. 4-Nitroanaline
61. 4,6-Dinitro-2-methylphenol
62. *n*-Nitroso-diphenylamine (diphenylamine)
63. 1,2-Diphenylhydrazine (as azobenzene)
64. 2,4,6-Tribromophenol (SS)
65. 4-Bromophenyl phenyl ether
66. Hexachlorobenzene
67. Pentachlorophenol
68. Phenanthrene-d10 (IS)
69. Phenanthrene
70. Anthracene
71. Carbazole
72. di-*n*-Butyl phthalate
73. Fluoranthene
74. Benzidine
75. Pyrene-d10 (SS)
76. Pyrene
77. *p*-Terphenyl-d14 (SS)
78. 3,3'-Dimethylbenzidine
79. Butyl benzyl phthalate
80. Bis(2-ethylhexyl) adipate
81. 3,3'-Dichlorobenzidine
82. Benzo[a]anthracene
83. Bis(2-ethylhexyl)phthalate
84. Chrysene-d12 (IS)
85. Chrysene
86. Di-*n*-octyl phthalate
87. Benzo[b]fluoranthene
88. Benzo[k]fluoranthene
89. Benzo[a]pyrene
90. Perylene-d12 (IS)
91. Indeno[1,2,3-cd]pyrene
92. Dibenzo[a,h]anthracene
93. Benzo[ghi]perylene

c = contaminant (toluene)

similar phases

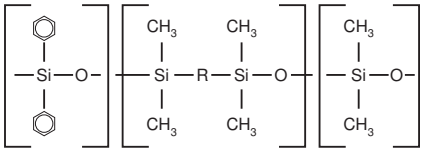
DB-XLB, VF-Xms, MR1, ZB-XLB

tech tip

Rxi®-XLB columns for Method 525.2
In combination with an Rxi®-XLB column, simple adjustments to the injection conditions can greatly improve sensitivity for active and high molecular weight Method 525.2 target compounds.

By eliminating contact between the sample and the hot metal surfaces in the injection port, a drilled Uniliner® inlet liner prevents analytes from degrading in the injection port.

Rxi®-35Sil MS Structure

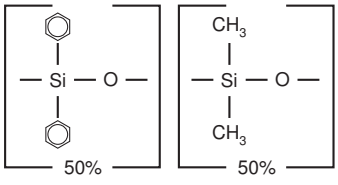


Similar to: (35%-phenyl)-methylpolysiloxane

similar phases

DB-35ms, DB-35msUI, VF-35ms, MR2

Rxi®-17 Structure



Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

HP-50+, DB-17, DB-17ht, DB-608, CP-Sil 24 CB, ZB-50

Rxi®-XLB Columns (fused silica)

(low polarity proprietary phase)

- General-purpose columns exhibiting extremely low bleed. Ideal for many GC-MS applications, including pesticides, PCB congeners (e.g., Aroclor mixes), PAHs.
- Unique selectivity.
- Temperature range: 30 °C to 360 °C.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	30 to 340/360 °C	13705	13708	
	0.25 µm	30 to 340/360 °C	13720	13723	13726
	0.50 µm	30 to 340/360 °C		13738	
	1.00 µm	30 to 340/360 °C		13753	
0.32 mm	0.25 µm	30 to 340/360 °C		13724	13727
	0.50 µm	30 to 340/360 °C		13739	
	1.00 µm	30 to 340/360 °C		13754	
0.53 mm	0.50 µm	30 to 320/360 °C		13740	
	1.50 µm	30 to 320/340 °C	13767	13770	

ID	df	temp. limits	20-Meter
0.18 mm	0.18 µm	30 to 340/360 °C	43702

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rxi®-35Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Special selectivity and excellent inertness for substituted polar compounds, such as drugs, pesticides, herbicides, PCBs, phenols, etc.
- Very low-bleed phase for GC-MS analysis.
- Extended temperature range: 50 °C to 340/360 °C.

ID	df	temp. limits*	15-Meter	30-Meter
0.25 mm	0.25 µm	50 to 340/360 °C	13820	13823
	0.50 µm	50 to 340/360 °C	13835	13838
	1.00 µm	50 to 320/340 °C	13850	13853
0.32 mm	0.25 µm	50 to 340/360 °C	13821	13824
	0.50 µm	50 to 340/360 °C	13836	13839
	1.00 µm	50 to 320/340 °C	13851	13854
0.53 mm	0.50 µm	50 to 340/360 °C	13837	13840
	1.00 µm	50 to 325/340 °C	13852	13855
	1.50 µm	50 to 310/330 °C	13856	13857
	3.00 µm	50 to 280/300 °C	13858	13859

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rxi®-17 Columns (fused silica)

(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.
- Temperature range: 40 °C to 320 °C.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.25 µm	40 to 280/320 °C	13520	13523
	0.50 µm	40 to 280/320 °C		13538
	1.00 µm	40 to 280/320 °C		13553
0.32 mm	0.25 µm	40 to 280/320 °C	13521	13524
	0.50 µm	40 to 280/320 °C		13539
	1.00 µm	40 to 280/320 °C		13554
0.53 mm	0.25 µm	40 to 280/320 °C		13525
	0.50 µm	40 to 280/320 °C		13540
	0.83 µm	40 to 280/320 °C		13569
	1.00 µm	40 to 280/320 °C	13552	13555
	1.50 µm	40 to 280/320 °C		13570

ID	df	temp. limits	20-Meter
0.18 mm	0.18 µm	40 to 280/320 °C	13502

Rxi®-17Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

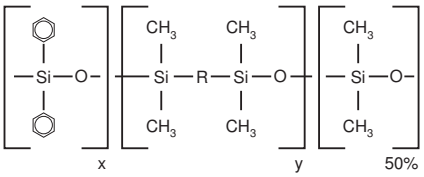
- 340/360 °C upper temperature limits.
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Equivalent to USP phase G3.
- Low bleed for use with sensitive detectors, such as MS.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	40 to 340/360 °C	14120	14123	14126
0.32 mm	0.25 µm	40 to 340/360 °C	14121	14124	

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821
0.18 mm	0.18 µm	40 to 340/360 °C		14102
	0.36 µm	40 to 340/360 °C		14111

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rxi®-17Sil MS Structure



Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

DB-17ms, VF-17ms, CP-Sil 24 CB, ZB-50

Rxi®-PAH Columns (fused silica)

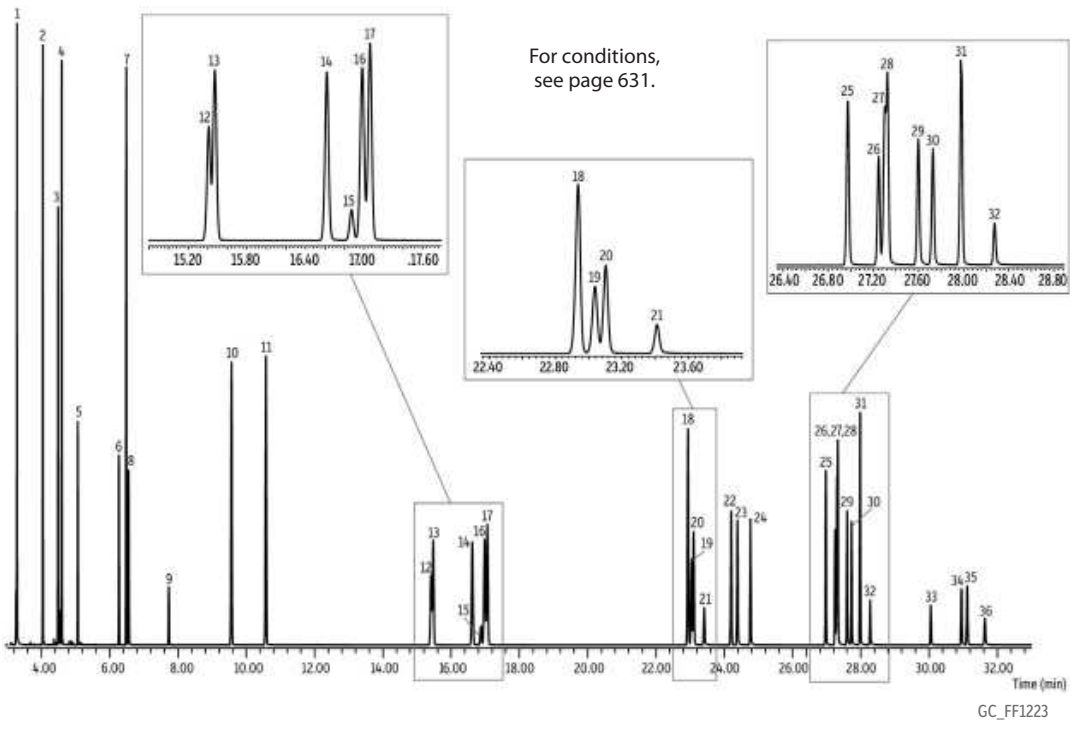
(midpolarity proprietary phase)

- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene.
- Best resolution of chrysene from interfering PAHs, triphenylene, and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [j], and [a] fluoranthenes.
- 360 °C thermal stability allows analysis of low volatility dibenzo pyrenes.

ID	df	temp. limits	30-Meter	40-Meter	60-Meter
0.18 mm	0.07 µm	to 360 °C		49316	
0.25 mm	0.10 µm	to 360 °C	49318		49317

NEW!

NIST SRM 2260a PAH Mix on Rxi®-PAH

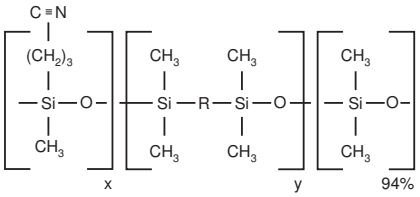


Peaks

1. Naphthalene
2. Biphenyl
3. Acenaphthylene
4. Acenaphthene
5. Fluorene
6. Dibenzothiophene
7. Phenanthrene
8. Anthracene
9. 4H-Cyclopenta[def] phenanthrene
10. Fluoranthene
11. Pyrene
12. Benzo[ghi]fluoranthene
13. Benzo[c]phenanthrene
14. Benz[a]anthracene
15. Cyclopenta[cd]pyrene
16. Triphenylene
17. Chrysene
18. Benzo[b]fluoranthene
19. Benzo[k]fluoranthene
20. Benzo[j]fluoranthene
21. Benzo[a]fluoranthene
22. Benzo[e]pyrene
23. Benzo[a]pyrene
24. Perylene
25. Dibenz[a,j]anthracene
26. Dibenz[a,c]anthracene
27. Indeno[1,2,3-cd]pyrene
28. Dibenz[a,h]anthracene
29. Benzo[b]chrysene
30. Picene
31. Benzo[ghi]perylene
32. Anthanthrene
33. Dibenzo[b,k]fluoranthene
34. Dibenzo[a,e]pyrene
35. Coronene
36. Dibenzo[a,h]pyrene

Rxi®-624Sil MS

Rxi®-624Sil MS Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-624, VF-624ms, CP-Select 624 CB, ZB-624

Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—highly selective for volatiles analysis and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

ID	df	temp. limits	20-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

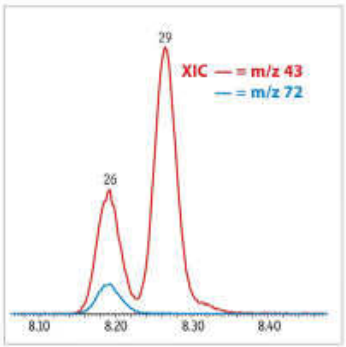
free literature

Rxi®-624Sil MS Columns: Exceptionally Inert, Low-Bleed Columns for Volatiles Analysis

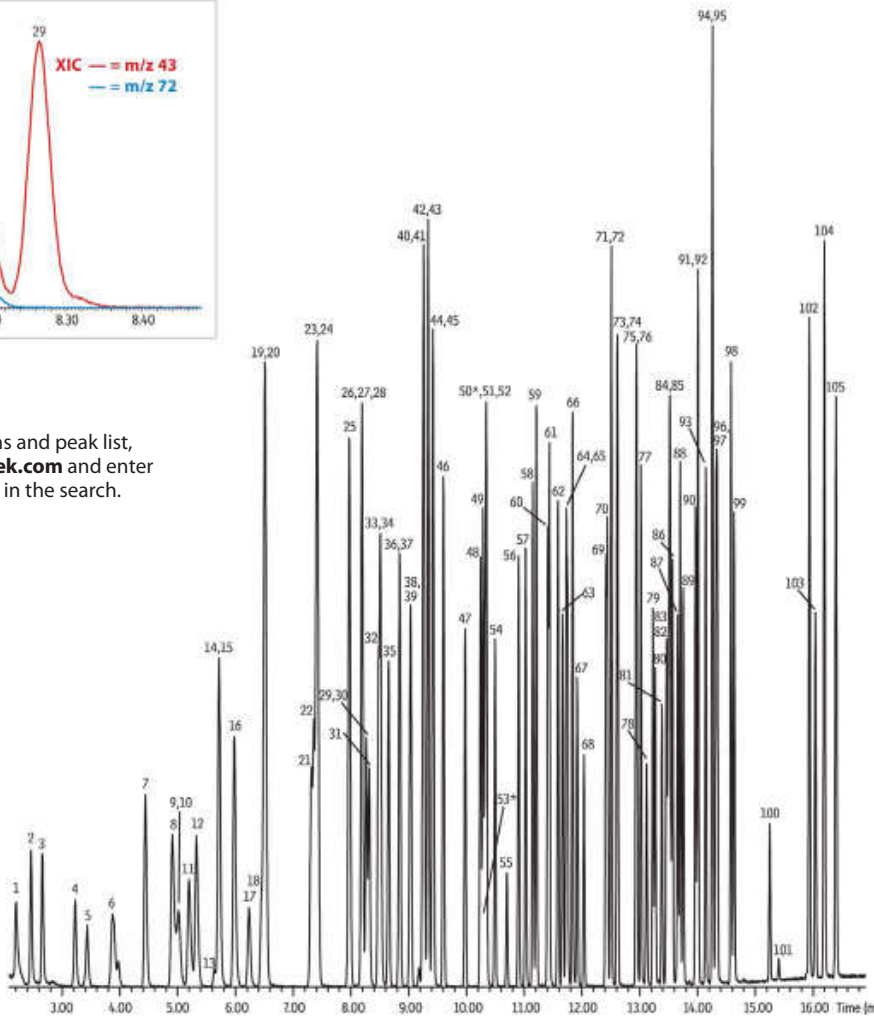
Download your free copy from **www.restek.com**

lit. cat.# GNBR1334A-UNV

Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)



For conditions and peak list, visit **www.restek.com** and enter GC_EV1169 in the search.



GC_EV1169

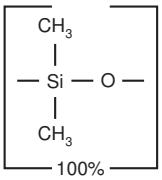
Rxi®-1HT Columns (fused silica)

(nonpolar phase; dimethyl polysiloxane)

- Columns processed for high-temperature applications, such as high molecular weight hydrocarbons.
- Temperature range: -60 to 400 °C.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.10 µm	-60 to 400 °C	13950	13951
	0.25 µm	-60 to 400 °C		13952
0.32 mm	0.10 µm	-60 to 400 °C	13953	13954
	0.25 µm	-60 to 400 °C		13955

Rxi®-1HT Structure



Similar to: (100%-methyl)-polysiloxane

similar phases

DB-1ht, ZB-1HTinferno

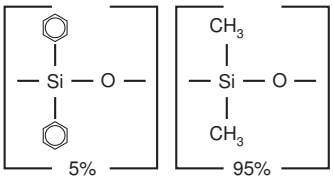
Rxi®-5HT Columns (fused silica)

(low polarity phase; diphenyl dimethyl polysiloxane)

- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high-temperature applications, such as mineral oil.
- Temperature range: -60 to 400 °C.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.10 µm	-60 to 400 °C	13905	13908
	0.25 µm	-60 to 400 °C		13923
0.32 mm	0.10 µm	-60 to 400 °C	13906	13909
	0.25 µm	-60 to 400 °C		13924
0.53 mm	0.15 µm	-60 to 380/400 °C		13910

Rxi®-5HT Structure

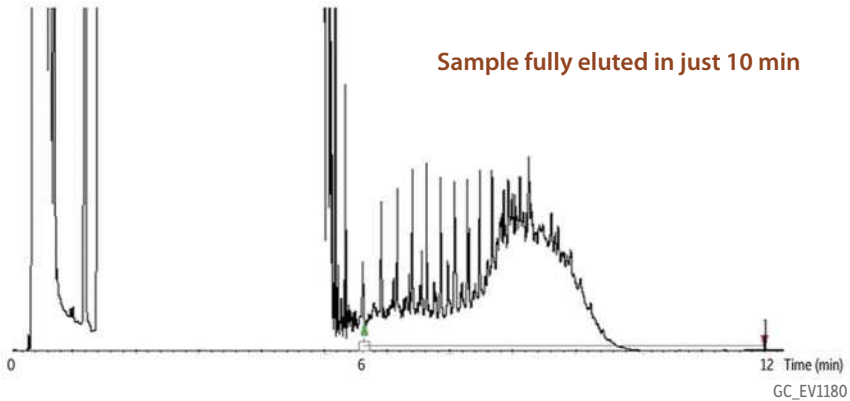


Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ht, VF-5ht, ZB-5HTinferno

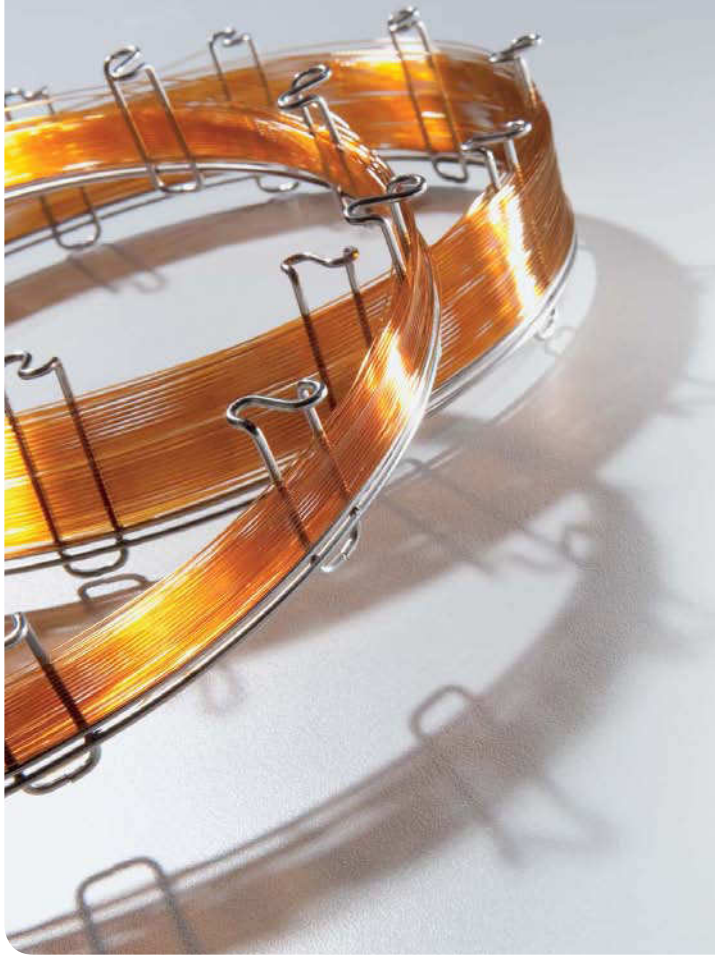
Mineral Oil on Rxi®-5HT by EN9377-2 (PTV large volume injection)



GC_EV1180

Column	Rxi®-5HT, 15 m, 0.32 mm ID, 0.10 µm (cat.# 13906)
Sample	Mineral oil
Diluent:	Hexane
Conc.:	25 ppm
Injection	
Inj. Vol.:	100 µL ptv splitless
Inlet Temp. Program:	45 °C (hold 0.45 min) to 350 °C at 200 °C/min (hold 10 min)
Oven	
Oven Temp:	35 °C (hold 4 min) to 150 °C at 60 °C/min to 250 °C at 50 °C/min to 350 °C at 30 °C/min
Carrier Gas	He, constant flow
Flow Rate:	2 mL/min
Detector	FID @ 360 °C
Instrument	Varian 450
Acknowledgement	Ambiente Analisi S.r.L, Italy

General-Purpose Columns



Chemically bonded capillary columns

- Reliable, rugged GC columns.
- Columns can be solvent rinsed.

Extensive GC column selection

- Available in many dimensions, including variations in length, internal diameter, and film thickness.
- Internal diameters include 0.15 mm and 0.18 mm for faster analysis time and greater resolution.

Broad range of stationary phases

- Columns based on polysiloxane backbone; functional groups added to the polymers to vary selectivity.

Rtx®-1 Columns (fused silica)

(nonpolar phase; Crossbond® dimethyl polysiloxane)

- General-purpose columns for solvent impurities, PCB congeners (e.g. Aroclor mixes), simulated distillation, arson accelerants, gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, oxygenates.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G1, G2, G38 phases.

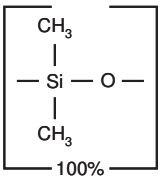
Rtx®-1 columns exhibit long lifetime and very low bleed at high operating temperatures.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25 mm	0.10 µm	-60 to 330/350 °C	10105	10108	10111	
	0.25 µm	-60 to 330/350 °C	10120	10123	10126	10129
	0.50 µm	-60 to 330/350 °C	10135	10138	10141	10144
	1.00 µm	-60 to 320/340 °C	10150	10153	10156	10159
0.32 mm	0.10 µm	-60 to 330/350 °C	10106	10109	10112	
	0.25 µm	-60 to 330/350 °C	10121	10124	10127	
	0.50 µm	-60 to 330/350 °C	10136	10139	10142	
	1.00 µm	-60 to 320/340 °C	10151	10154	10157	10160
	1.50 µm	-60 to 310/330 °C	10166	10169	10172	10175
	3.00 µm	-60 to 280/300 °C	10181	10184	10187	10190
	4.00 µm	-60 to 280/300 °C		10198		
	5.00 µm	-60 to 260/280 °C	10176	10178	10180	
0.53 mm	0.10 µm	-60 to 320/340 °C	10107	10110		
	0.25 µm	-60 to 320/340 °C	10122	10125	10128	
	0.50 µm	-60 to 310/330 °C	10137	10140	10143	
	1.00 µm	-60 to 310/330 °C	10152	10155	10158	
	1.50 µm	-60 to 310/330 °C	10167	10170	10173	
	3.00 µm	-60 to 270/290 °C	10182	10185	10188	10189
	5.00 µm	-60 to 270/290 °C	10177	10179	10183	10194
	7.00 µm	-60 to 240/260 °C	10191	10192	10193	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.18 mm	0.20 µm	-60 to 330/350 °C	40101	40102	40103
	0.40 µm	-60 to 330/340 °C	40110	40111	40112

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-1 Structure



Similar to: (100%-methyl)-polysiloxane

similar phases

HP-1, DB-1, CP-Sil 5 CB, ZB-1

also available

Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

See **page 93.**

Rtx®-1 with Integra-Guard® Column

- Extend column lifetime.
- Eliminate leaks with a built-in guard column.
- Inertness verified by isothermal testing.

Description	qty.	cat.#
30 m, 0.25 mm ID, 0.25 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10123-124
30 m, 0.53 mm ID, 1.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10155-126
30 m, 0.53 mm ID, 5.00 µm Rtx-1 w/5 m Integra-Guard Column	ea.	10179-126

crossbond® technology

Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

free literature

Analyze ppb Level Sulfur Compounds Using an Rt®-XLSulfur Micropacked GC Column or an Rtx®-1 Thick Film Capillary GC Column

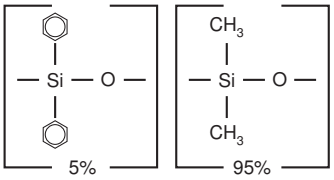
Download your free copy from **www.restek.com**

lit. cat.# PCAN1499-UNV

Fused Silica, PLOT, & MXT® Capillary GC Column Ferrule Guide

GC Column ID	Ferrule ID
0.10 mm	0.4
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.28 mm	0.4
0.32 mm	0.5
0.45 mm	0.8
0.53 mm	0.8

Rtx®-5/Rtx®-5MS Structure



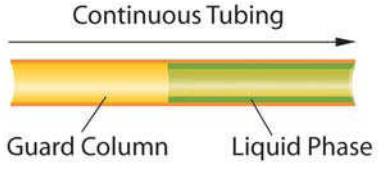
Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

HP-5, DB-5, CP-Sil 8 CB, ZB-5

NOTE: DB-5MS is a silarylene-based polymer, similar to Rxi-5Sil MS.

Integra-Guard® Built-In Guard Column



Get the protection without the connection!
See **page 25** for Rtx®-5 and Rtx®-5MS columns with built-in Integra-Guard® guard columns.

also available

Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-5 columns .....page 94

it's a fact

For exceptional inertness, ultra-low bleed, and unsurpassed performance, choose Rxi®-5ms columns! See **page 31**.

also available

Rtx®-5 Amine columns.....page 86

Rtx®-5/Rtx®-5MS (fused silica)

- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semivolatiles.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G27 and G36 phases.

The diphenyl dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx®-5 polymer, providing a tight mono-modal distribution and extremely low bleed.

Rtx®-5 Columns (fused silica)

(low polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25 mm	0.10 µm	-60 to 330/350 °C	10205	10208	10211	
	0.25 µm	-60 to 330/350 °C	10220	10223	10226	10229
	0.50 µm	-60 to 330/350 °C	10235	10238	10241	10244
	1.00 µm	-60 to 325/340 °C	10250	10253	10256	10259
0.32 mm	0.10 µm	-60 to 330/350 °C	10206	10209	10212	
	0.25 µm	-60 to 330/350 °C	10221	10224	10227	
	0.50 µm	-60 to 330/350 °C	10236	10239	10242	
	1.00 µm	-60 to 325/340 °C	10251	10254	10257	10260
	1.50 µm	-60 to 310/330 °C	10266	10269	10272	10275
	3.00 µm	-60 to 280/300 °C	10281	10284	10287	10290
0.53 mm	0.10 µm	-60 to 320/340 °C	10207	10210		
	0.25 µm	-60 to 320/340 °C	10222	10225	10228	
	0.50 µm	-60 to 320/330 °C	10237	10240	10243	
	1.00 µm	-60 to 320/330 °C	10252	10255	10258	
	1.50 µm	-60 to 310/330 °C	10267	10270	10273	
	3.00 µm	-60 to 270/290 °C	10282	10285	10288	
	5.00 µm	-60 to 270/290 °C	10277	10279	10283	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.18 mm	0.20 µm	-60 to 325/340 °C	40201	40202	40203
	0.40 µm	-60 to 315/330 °C	40210	40211	40212

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

30-meter	6-pack cat.#
0.25 mm ID, 0.25 µm	10223-600
0.25 mm ID, 0.50 µm	10238-600
0.32 mm ID, 1.00 µm	10254-600
0.53 mm ID, 1.50 µm	10270-600

Six columns for the price of five!
Other phases and configurations available on request.

Rtx®-5MS—Low-Bleed GC-MS Columns (fused silica)

(low polarity phase; Crossbond® diphenyl dimethyl polysiloxane)
Column specifically tested for low-bleed performance.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	-60 to 330/350 °C	12605	12608	12611
	0.25 µm	-60 to 330/350 °C	12620	12623	12626
	0.50 µm	-60 to 330/350 °C	12635	12638	12641
	1.00 µm	-60 to 325/350 °C	12650	12653	
0.32 mm	0.10 µm	-60 to 330/350 °C	12606	12609	12612
	0.25 µm	-60 to 330/350 °C	12621	12624	12627
	0.50 µm	-60 to 330/350 °C		12639	12642
	1.00 µm	-60 to 325/350 °C	12651	12654	
0.53 mm	0.50 µm	-60 to 320/340 °C	12637	12640	
	1.00 µm	-60 to 320/340 °C	12652	12655	
	1.50 µm	-60 to 310/330 °C	12667	12670	

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-20 Columns (fused silica)

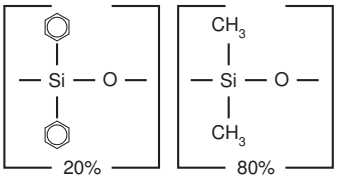
(low to midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for volatile compounds, flavor compounds, alcoholic beverages.
- Temperature range: -20 °C to 320 °C.
- Equivalent to USP G28, G32 phases.

Rtx®-20 polymer is synthesized to exacting standards. All residual catalysts and low molecular weight fragments are removed from the polymer, providing a tight monomodal distribution and extremely low bleed.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.25 µm	-20 to 300/320 °C	10320	10323
	0.50 µm	-20 to 290/310 °C		10338
	1.00 µm	-20 to 280/300 °C		10353
0.32 mm	0.25 µm	-20 to 300/320 °C		10324
	0.50 µm	-20 to 290/310 °C		10339
	1.00 µm	-20 to 280/300 °C		10354
0.53 mm	1.00 µm	-20 to 260/280 °C	10352	10355

Rtx®-20 Structure



Similar to: (20%-phenyl)-methylpolysiloxane

similar phases

SPB-20, EC-20, AT-20, 007-20

Rtx®-35 Columns (fused silica)

(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

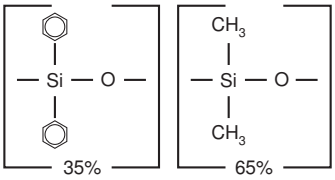
- General-purpose columns for organochlorine pesticides, PCB congeners (e.g., Aroclor mixes), herbicides, pharmaceuticals, sterols, rosin acids, phthalate esters.
- Temperature range: 40 °C to 320 °C.
- Equivalent to USP G42 phase.

An Rtx®-35 column is a popular confirmation column for pesticides and herbicides, in conjunction with an Rtx®-5 or Rtx®-1701 column. The higher phenyl content causes useful elution order and retention time changes.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.25 µm	40 to 320 °C	10420	10423
	0.50 µm	40 to 310 °C	10435	10438
	1.00 µm	40 to 290 °C		10453
0.32 mm	0.25 µm	40 to 320 °C	10421	10424
	0.50 µm	40 to 310 °C	10436	10439
	1.00 µm	40 to 290 °C		10454
0.53 mm	0.50 µm	40 to 300 °C	10437	10440
	1.00 µm	40 to 290 °C		10455
	1.50 µm	40 to 280 °C		10470
	3.00 µm	40 to 240/260 °C		10485

ID	df	temp. limits	10-Meter	20-Meter
0.18 mm	0.20 µm	40 to 300/320 °C		40402
	0.40 µm	40 to 290/310 °C	40410	40411

Rtx®-35 Structure



Similar to: (35%-phenyl)-methylpolysiloxane

similar phases

HP-35, DB-35, ZB-35

also available

Metal MXT® Columns

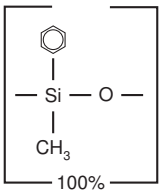
Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-20 columns .....page 94
MXT®-35 columns .....page 95

also available

Rtx®-35 Amine columns .....page 87

Rtx®-50 Structure



Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

SPB-50, AT-50, 007-17

also available

Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-50 columns .....page 95
MXT®-65 columns .....page 95

Rtx®-50 Columns (fused silica)

(midpolarity phase; Crossbond® phenyl methyl polysiloxane)

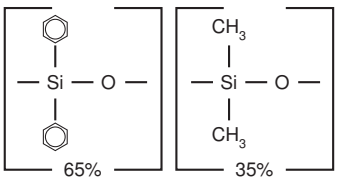
- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, sterols.
- Temperature range: 40 °C to 320 °C.
- Equivalent to USP G3 phase.

The high thermal stability of Rtx®-50 columns makes possible dual-column analysis with common phases such as Rtx®-1 or Rtx®-5MS.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	40 to 300/320 °C	10520	10523	10526
	0.50 µm	40 to 290/310 °C	10535	10538	10541
	1.00 µm	40 to 280/300 °C	10550	10553	10556
0.32 mm	0.25 µm	40 to 300/320 °C	10521	10524	10527
	0.50 µm	40 to 290/310 °C	10536	10539	10542
	1.00 µm	40 to 280/300 °C	10551	10554	10557
0.53 mm	0.25 µm	40 to 280/300 °C	10522		
	0.50 µm	40 to 270/290 °C	10537	10540	10543
	0.83 µm	40 to 270/290 °C		10569	
	1.00 µm	40 to 260/280 °C	10552	10555	10558
	1.50 µm	40 to 250/270 °C	10567	10570	10573

ID	df	temp. limits	10-Meter	20-Meter
0.18 mm	0.20 µm	40 to 310/330 °C	40501	40502
	0.40 µm	40 to 300/320 °C	40510	40511

Rtx®-65 Structure



Similar to: (65%-phenyl)-methylpolysiloxane

similar phase

007-65HT

Rtx®-65 Columns (fused silica)

(mid to high polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for phenols, fatty acids, triglycerides.
- Temperature range: 50 °C to 300 °C.
- Equivalent to USP G17 phase.

The Rtx®-65 phase contains the highest phenyl content of any bonded stationary phase available to improve separation of aromatic compounds through increased phase-analyte interaction. A unique polarity makes these columns ideal for a variety of analyses, from phenols to FAMEs. As a confirmation column for EPA Method 604 phenols, an Rtx®-65 column produces a different elution order compared to the primary Rtx®-5 column. Rtx®-65 columns elute FAMEs according to equivalent chain length, similar to bonded Carbowax® columns, but the Rtx®-65 phase does not suffer the thermal stability limitations of other polar stationary phases.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	50 to 300 °C	17023
	0.50 µm	50 to 280/300 °C	17038
	1.00 µm	50 to 260/280 °C	17053
0.32 mm	0.25 µm	50 to 300 °C	17024
	0.50 µm	50 to 280/300 °C	17039
	1.00 µm	50 to 260/280 °C	17054
0.53 mm	1.00 µm	50 to 250/270 °C	17055

crossbond® technology

Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

also available

Rtx®-65TG Columns

Tested specifically for triglycerides.

See **page 74.**

Rtx®-440 Columns (fused silica)

(midpolarity proprietary Crossbond® phase)

restek innovation!

- General-purpose columns with unique selectivity for pesticides, PAHs, or other semivolatiles. Ideal for low/trace level analyses.
- Low-bleed, high-resolution columns with unique selectivity.
- Wide temperature range: 20 °C to 340 °C.

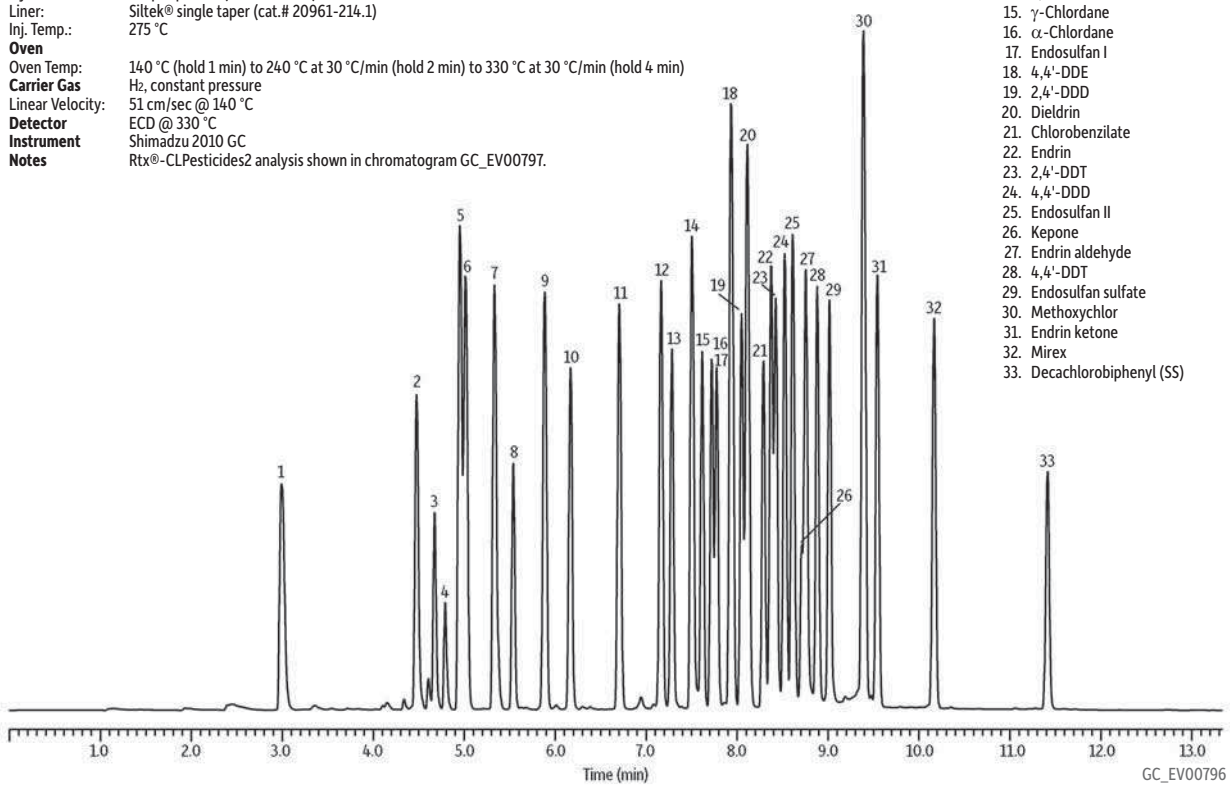
ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	20 to 320/340 °C	12923
	0.50 µm	20 to 320/340 °C	12938
0.32 mm	0.25 µm	20 to 320/340 °C	12924
	0.50 µm	20 to 320/340 °C	12939
0.53 mm	0.50 µm	20 to 320/340 °C	12940
	1.00 µm	20 to 320/340 °C	12955

ID	df	temp. limits	20-Meter
0.18 mm	0.18 µm	20 to 320 °C	42902

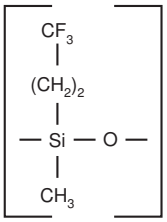
Organochlorine Pesticides by EPA Method 8081A on Rtx®-440 (dual column w/ Rtx®-CLPesticides2)

Column Rtx®-440, 30 m, 0.32 mm ID, 0.50 µm (cat.# 12939)
Sample Organochlorine pesticide mix AB #2, 8-80 µg/mL in ethyl acetate (cat.# 32292)
Chlorobenzilate, 1,000 µg/mL in methanol (cat.# 32211)
Hexachlorobenzene, 1,000 µg/mL in acetone (cat.# 32231)
Hexachlorocyclopentadiene, 1,000 µg/mL in methanol (cat.# 32232)
2,4'-DDD, 1,000 µg/mL in methanol (cat.# 32098)
2,4'-DDE, 1,000 µg/mL in methanol (cat.# 32099)
2,4'-DDT, 1,000 µg/mL in methanol (cat.# 32200)
2,4,5,6-Tetrachloro-*m*-xylene, 200 µg/mL in acetone (cat.# 32027)
Decachlorobiphenyl (BZ #209), 200 µg/mL in acetone (cat.# 32029)
Diallate (*cis* & *trans*), 1,000 µg/mL in hexane (cat.# custom)
Isodrin, 1,000 µg/mL in hexane (cat.# custom)
Kepone, 1,000 µg/mL in hexane (cat.# custom)
Mirex, 1,000 µg/mL in hexane (cat.# custom)
Injection
Inj. Vol.: 1.0 µL splitless (hold 0.75 min)
Liner: Siltek® single taper (cat.# 20961-214.1)
Inj. Temp.: 275 °C
Oven
Oven Temp: 140 °C (hold 1 min) to 240 °C at 30 °C/min (hold 2 min) to 330 °C at 30 °C/min (hold 4 min)
Carrier Gas H_2, constant pressure
Linear Velocity: 51 cm/sec @ 140 °C
Detector ECD @ 330 °C
Instrument Shimadzu 2010 GC
Notes Rtx®-CLPesticides2 analysis shown in chromatogram GC_EV00797.

Peaks
1. Hexachlorocyclopentadiene
2. 2,4,5,6-Tetrachloro-*m*-xylene (SS)
3. *cis*-Diallate
4. *trans*-Diallate
5. α-BHC
6. Hexachlorobenzene
7. γ-BHC
8. β-BHC
9. δ-BHC
10. Heptachlor
11. Aldrin
12. Isodrin
13. Heptachlor epoxide
14. 2,4'-DDE
15. γ-Chlordane
16. α-Chlordane
17. Endosulfan I
18. 4,4'-DDE
19. 2,4'-DDD
20. Dieldrin
21. Chlorobenzilate
22. Endrin
23. 2,4'-DDT
24. 4,4'-DDD
25. Endosulfan II
26. Kepone
27. Endrin aldehyde
28. 4,4'-DDT
29. Endosulfan sulfate
30. Methoxychlor
31. Endrin ketone
32. Mirex
33. Decachlorobiphenyl (SS)



Rtx®-200 Structure



Similar to: (trifluoropropyl)-methylpolysiloxane

similar phases

DB-210, DB-200, VF-200ms

Rtx®-200/Rtx®-200MS (fused silica)

- General-purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, glycols, and drugs of abuse. Excellent confirmation column with an Rtx®-5 column for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, and chlorophenoxy herbicides.
- Temperature range: -20 °C to 340 °C.
- Equivalent to USP G6 phase.

Rtx®-200 columns have accomplished many difficult separations not possible on any other bonded stationary phase. Many analysts consider these the best, most inert mid-polarity columns available. The trifluoropropylmethyl polysiloxane stationary phase has a unique selectivity that changes elution orders and resolves compounds that phenyl, cyano, or Carbowax® phases can not. The Rtx®-200 column offers exceptional thermal stability, low bleed, and superior inertness—even for active compounds such as phenols, and with sensitive detectors such as ECDs, NPDs, and MSDs.

Rtx®-200 Columns (fused silica)

(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25 mm	0.25 µm	-20 to 320/340 °C	15020	15023	15026	15029
	0.50 µm	-20 to 310/330 °C	15035	15038	15041	15044
	1.00 µm	-20 to 290/310 °C	15050	15053	15056	15059
0.32 mm	0.25 µm	-20 to 320/340 °C	15021	15024	15027	
	0.50 µm	-20 to 310/330 °C	15036	15039	15042	15045
	1.00 µm	-20 to 290/310 °C	15051	15054	15057	15060
	1.50 µm	-20 to 280/300 °C	15066	15069	15072	15075
0.53 mm	0.25 µm	-20 to 310/330 °C	15022	15025	15028	
	0.50 µm	-20 to 300/320 °C	15037	15040	15043	
	1.00 µm	-20 to 290/310 °C	15052	15055	15058	
	1.50 µm	-20 to 280/300 °C	15067	15070	15073	
	3.00 µm	-20 to 260/280 °C	15082	15085	15088	15091

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.15 mm	0.15 µm	-20 to 320/340 °C	43835	43836	
0.18 mm	0.20 µm	-20 to 310/330 °C	45001	45002	45003
	0.40 µm	-20 to 310/330 °C	45010	45011	45012

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

also available

Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-200 columns.....page 96

Rtx®-200MS—Low-Bleed GC-MS Columns (fused silica)

(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

Column specifically tested for low-bleed performance.

ID	df	temp. limits	30-Meter
0.25 mm	0.10 µm	-20 to 320/340 °C	15608
	0.25 µm	-20 to 320/340 °C	15623
	0.50 µm	-20 to 310/330 °C	15638
	1.00 µm	-20 to 290/310 °C	15653
0.32 mm	0.10 µm	-20 to 320/340 °C	15609
	0.25 µm	-20 to 320/340 °C	15624
	0.50 µm	-20 to 310/330 °C	15639
	1.00 µm	-20 to 290/310 °C	15654

Rtx®-1301 (G43) Columns (fused silica)

(low to midpolarity phase; Crossbond® cyanopropylphenyl dimethyl polysiloxane)

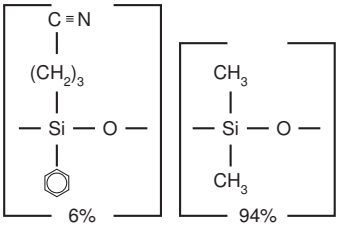
- General-purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.

Many analysts feel the Rtx®-1301 column has the best cyanosiloxane bonded stationary phase available, with no other column manufacturer providing lower bleed, longer lifetime, or better inertness. Our polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed—even with sensitive detectors such as ECDs and MSDs.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.25 mm	0.25 µm	-20 to 280 °C	16020	16023	16026		
	0.50 µm	-20 to 270 °C		16038			
	1.00 µm	-20 to 260 °C		16053	16056		
	1.40 µm	-20 to 240 °C			16016		
0.32 mm	0.25 µm	-20 to 280 °C	16021	16024			
	0.50 µm	-20 to 270 °C		16039	16042		
	1.00 µm	-20 to 260 °C		16054	16057		
	1.50 µm	-20 to 250 °C	16066	16069	16072		
	1.80 µm	-20 to 240 °C		16092	16093		
0.53 mm	0.25 µm	-20 to 280 °C		16025			
	0.50 µm	-20 to 270 °C		16040	16043		
	1.00 µm	-20 to 260 °C	16052	16055	16058		
	1.50 µm	-20 to 250 °C		16070			
	3.00 µm	-20 to 240 °C		16085	16088	16076	16091

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-1301 Structure

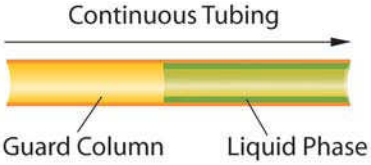


Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-1301, DB-624, VF-1301ms, VF-624ms, CP-1301, ZB-624

Integra-Guard® Built-In Guard Column



Get the protection without the connection!

See **page 25** for Rtx®-1301 and Rtx®-624 columns with built-in Integra-Guard® guard columns.

Rtx®-624 Columns (fused silica)

(low to midpolarity phase; Crossbond® cyanopropylphenyl dimethyl polysiloxane)

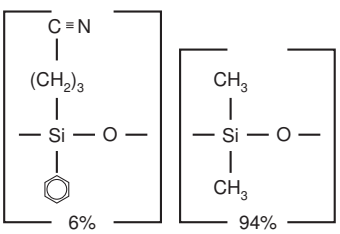
- Application-specific columns for volatile organic pollutants. Recommended in U.S. EPA methods for volatile organic pollutants.
- Temperature range: -20 °C to 240 °C.
- Equivalent to USP G43 phase.

The unique polarity of the Rtx®-624 column makes it ideal for analyzing volatile organic pollutants. Although the Rtx®-502.2 column is recommended in many methods, the Rtx®-624 column offers better resolution of early eluting compounds. The Rtx®-624 phase produces greater than 90% resolution of the first six gases in EPA Methods 8260 and 524.2. This stationary phase is especially well-suited for EPA Method 524.2 since it resolves 2-nitropropane from 1,1-dichloropropanone, which share quantification ion m/z 43 and must be separated chromatographically.

ID	df	temp. limits	30-Meter	60-Meter	75-Meter	105-Meter
0.25 mm	1.40 µm	-20 to 240 °C	10968	10969		
0.32 mm	1.80 µm	-20 to 240 °C	10970	10972		
0.45 mm	2.55 µm	-20 to 240 °C			10982	
0.53 mm	3.00 µm	-20 to 240 °C	10971	10973	10974	10975

ID	df	temp. limits	20-Meter	40-Meter
0.18 mm	1.00 µm	-20 to 240 °C	40924	40925

Rtx®-624 Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-1301, DB-624, VF-1301ms, VF-624ms, CP-1301, ZB-624

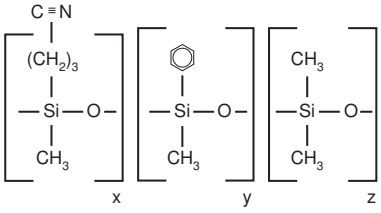
also available

Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-1301 columns .....page 95
MXT®-624 columns.....page 97

Rtx®-1701 Structure

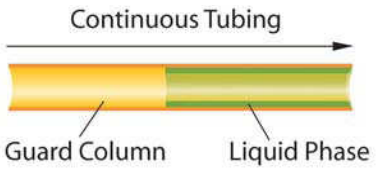


Similar to: (14%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-1701R, DB-1701, CP Sil 19 CB, VF-1701ms, VF-1701 Pesticides, ZB-1701, ZB-1701P

Integra-Guard® Built-In Guard Column



Get the protection without the connection!
See **page 25** for Rtx®-1701 columns with built-in Integra-Guard® guard columns.

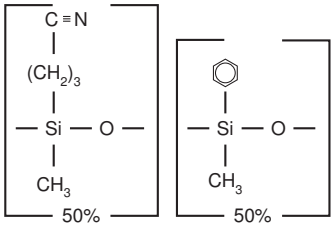
also available

Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-1701 columns .....page 96

Rtx®-225 Structure



Similar to: (50%-cyanopropylmethyl)-methylphenylpolysiloxane

similar phases

DB-225ms, CP-Sil 43 CB

Rtx®-1701 Columns (fused silica)

(midpolarity Crossbond® phase)

- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g. Aroclor mixes), pesticides.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G46 phase.

Rtx®-1701 is one of the more popular stationary phases used in capillary GC. The mix of cyano and phenyl functional groups increases the polarity and offers a different elution order relative to less polar Rtx®-1 or Rtx®-5 columns. An Rtx®-1701 column is ideal for confirmation analysis in combination with an Rtx®-35 or Rtx®-5 column. The polymer is fully characterized to ensure long-term reproducibility, column-to-column consistency, and low bleed, even with sensitive detectors such as ECDs and MSDs.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	-20 to 280 °C			12011
	0.25 µm	-20 to 280 °C	12020	12023	12026
	0.50 µm	-20 to 270/280 °C	12035	12038	12041
	1.00 µm	-20 to 260/280 °C	12050	12053	12056
0.32 mm	0.10 µm	-20 to 280 °C		12009	
	0.25 µm	-20 to 280 °C	12021	12024	12027
	0.50 µm	-20 to 270/280 °C	12036	12039	12042
	1.00 µm	-20 to 260/280 °C	12051	12054	12057
	1.50 µm	-20 to 240/260 °C	12066	12069	12072
0.53 mm	0.25 µm	-20 to 270/280 °C		12025	
	0.50 µm	-20 to 260/270 °C	12037	12040	
	1.00 µm	-20 to 250/270 °C	12052	12055	12058
	1.50 µm	-20 to 240/260 °C	12067	12070	12073
	3.00 µm	-20 to 230/250 °C	12082	12085	12088

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.18 mm	0.20 µm	-20 to 280 °C	42001	42002	42003
	0.40 µm	-20 to 280 °C		42011	42012

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-225 Columns (fused silica)

(polar phase; Crossbond® cyanopropylmethyl phenylmethyl polysiloxane)

- General-purpose columns for FAMEs, carbohydrates, sterols, flavor compounds.
- Temperature range: 40 °C to 240 °C.
- Equivalent to USP G7, G19 phases.

The cyanopropyl-containing Rtx®-225 phase is slightly less polar than bonded polyethylene glycol (PEG) phases, but it can be used for many of the same applications.

Improvements to the Rtx®-225 polymer have increased thermal stability, reduced bleed, and improved inertness. The Rtx®-225 column provides a 20 °C thermal stability advantage over other "225" columns because of our unique polymer synthesis technology and proprietary siloxane deactivation. In most similar columns, the Carbowax® deactivation layer is not fully compatible with the cyanopropyl siloxane polymer, which can cause adsorption, tailing of active compounds, and lower efficiency.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	40 to 220/240 °C	14020	14023	14026
	0.50 µm	40 to 220/240 °C		14038	
0.32 mm	0.25 µm	40 to 220/240 °C	14021	14024	
	0.50 µm	40 to 220/240 °C		14039	
	1.00 µm	40 to 200/220 °C	14051	14054	14057
0.53 mm	0.25 µm	40 to 200/220 °C	14022	14025	
	0.50 µm	40 to 200/220 °C		14040	
	1.00 µm	40 to 200/220 °C	14052	14055	

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rtx®-2330 Columns (fused silica)

(highly polar phase; biscyanopropyl cyanopropylphenyl polysiloxane)

- General-purpose columns for *cis*/*trans* FAMEs, dioxin isomers.
- Temperature range: 0 °C to 275 °C.
- Equivalent to USP G8 and G48 phase.

Rtx®-2330 is one of the most polar capillary column stationary phases. Cyano groups on both sides of the polymer backbone give the phase a strong dipole moment and high selectivity for *cis*/*trans* compounds or compounds with conjugated double bonds. Highly polar columns typically exhibit poor column efficiencies, high bleed, and short column lifetimes when thermally cycled. To overcome some of these problems, we developed a surface treatment that is more compatible with the Rtx®-2330 phase. In addition, our improved polymer produces columns with better column efficiency and lower bleed.

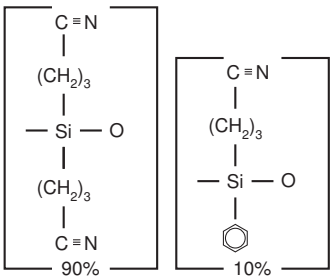
Because the Rtx®-2330 stationary phase is not 100% bonded, it should not be solvent rinsed.

ID	df	temp. limits*	30-Meter	60-Meter	105-Meter
0.25 mm	0.10 µm	0 to 260/275 °C	10708	10711	10714
	0.20 µm	0 to 260/275 °C	10723	10726	10729
0.32 mm	0.20 µm	0 to 260/275 °C	10724	10727	10730
0.53 mm	0.10 µm	0 to 260/275 °C		10713	
	0.20 µm	0 to 260/275 °C	10725	10728	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.18 mm	0.10 µm	0 to 260 °C	40701	40702	40703

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Rtx®-2330 Structure



Similar to: (95%-cyanopropyl)-phenyl polysiloxane

similar phase

VF-23ms

tech tip

Do not solvent rinse Rtx®-2330 and Rt®-2560 columns. These columns are not fully bonded and solvent rinsing will remove the stationary phase.

Rt®-2560 Column (fused silica)

(highly polar phase; biscyanopropyl polysiloxane—not bonded)

- Application-specific column for *cis*/*trans* FAMEs.
- Stable to 250 °C.

Because the Rt®-2560 stationary phase is not bonded, it should not be solvent rinsed.

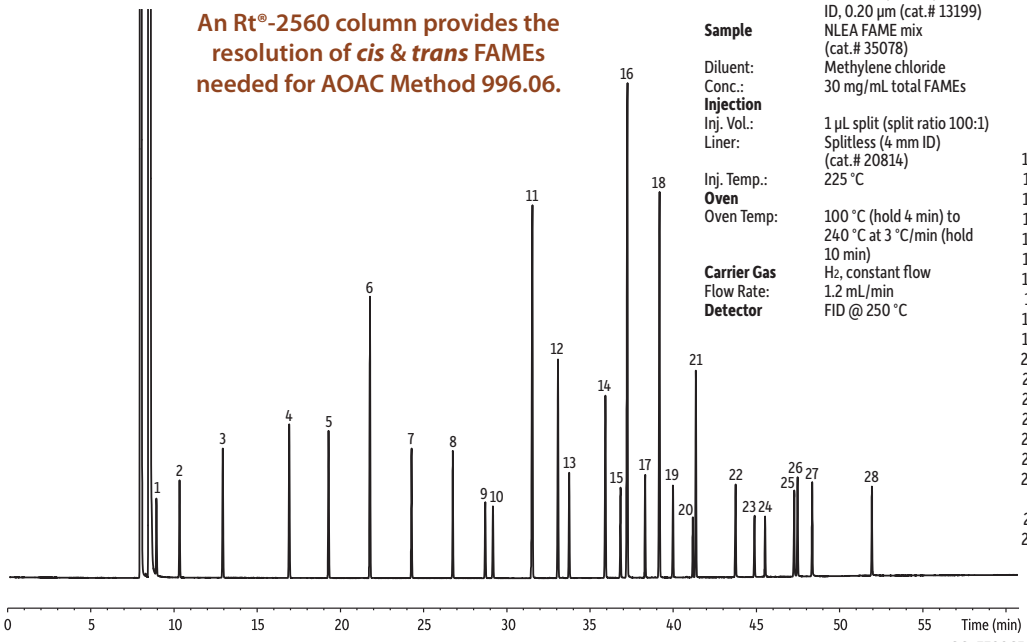
ID	df	temp. limits	100-Meter
0.25 mm	0.20 µm	20 to 250 °C	13199

similar phases

HP-88, CP Sil 88

FAMEs (NLEA Mix) on Rt®-2560

An Rt®-2560 column provides the resolution of ***cis*** & ***trans*** FAMEs needed for AOAC Method 996.06.



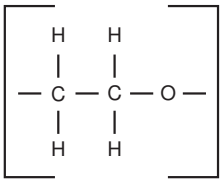
GC_FF00651

Column	Rt®-2560, 100 m, 0.25 mm ID, 0.20 µm (cat.# 13199)
Sample	NLEA FAME mix (cat.# 35078)
Diluent:	Methylene chloride
Conc.:	30 mg/mL total FAMEs
Injection	
Inj. Vol.:	1 µL split (split ratio 100:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	100 °C (hold 4 min) to 240 °C at 3 °C/min (hold 10 min)
Carrier Gas	H_2, constant flow
Flow Rate:	1.2 mL/min
Detector	FID @ 250 °C

Peaks

1. C4:0 methyl butyrate
2. C6:0 methyl hexanoate
3. C8:0 methyl octanoate
4. C10:0 methyl decanoate
5. C11:0 methyl undecanoate
6. C12:0 methyl laurate
7. C13:0 methyl tridecanoate
8. C14:0 methyl myristate
9. C14:1 methyl myristoleate (*cis*-9)
10. C15:0 methyl pentadecanoate
11. C16:0 methyl palmitate
12. C16:1 methyl palmitoleate (*cis*-9)
13. C17:0 methyl heptadecanoate
14. C18:0 methyl stearate
15. C18:1 methyl elaidate (*trans*-9)
16. C18:1 methyl oleate (*cis*-9)
17. C18:2 methyl linoelaidate (*trans*-9,12)
18. C18:2 methyl linoleate (*cis*-9,12)
19. C20:0 methyl arachidate
20. C20:1 methyl eicosenoate (*cis*-11)
21. C18:3 methyl linolenate (*cis*-9,12,15)
22. C22:0 methyl behenate
23. C22:1 methyl erucate (*cis*-13)
24. C23:0 methyl tricosanoate
25. C24:0 methyl lignocerate
26. C20:5 methyl eicosapentaenoate (*cis*-5,8,11,14,17)
27. C24:1 methyl nervonate (*cis*-15)
28. C22:6 methyl docosahexaenoate (*cis*-4,7,10,13,16,19)

Rtx®-Wax Structure



similar phases

DB-Wax, CP Wax 52 CB, ZB-Wax

Rtx®-Wax Columns (fused silica)

(polar phase; Crossbond® polyethylene glycol)

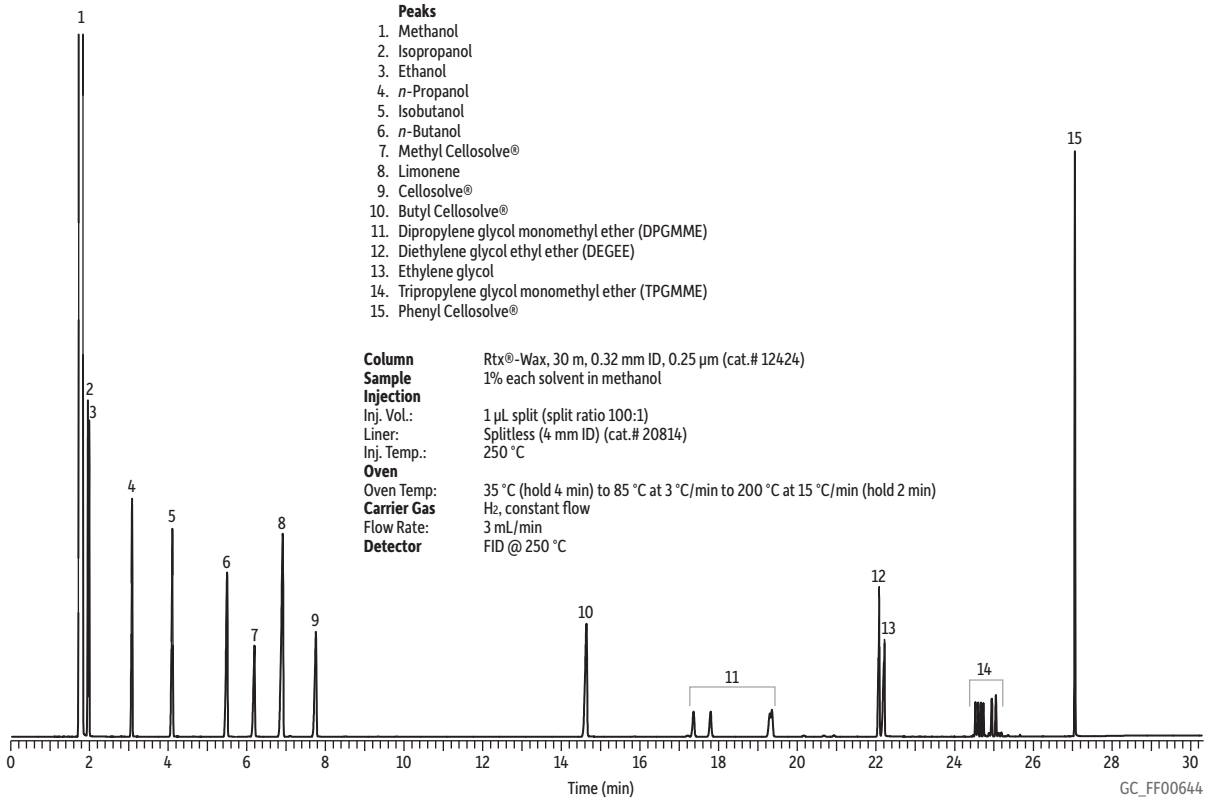
- Best polyethylene glycol (PEG) phase for alkenols, glycols, and aldehydes.
- Temperature range: 20 °C to 250 °C.
- Equivalent to USP G14, G15, G16, G20, G39 phases.

Rtx®-Wax columns are the most inert and efficient PEG columns currently available. The extended operating temperature range allows analysis of compounds having a wide volatility range, and ensures low bleed at temperatures as high as 250 °C. Selectivity is comparable to other Carbowax® columns for compounds of intermediate to high polarity.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	20 to 250 °C	12420	12423	12426
	0.50 µm	20 to 250 °C	12435	12438	12441
0.32 mm	0.25 µm	20 to 250 °C	12421	12424	12427
	0.50 µm	20 to 250 °C	12436	12439	12442
	1.00 µm	20 to 240/250 °C	12451	12454	12457
0.53 mm	0.25 µm	20 to 250 °C	12422	12425	
	0.50 µm	20 to 250 °C	12437	12440	12443
	1.00 µm	20 to 240/250 °C	12452	12455	12458

*Maximum temperatures listed are for 15- and 30-meter lengths. Longer lengths may have a slightly reduced maximum temperature.

Cleaning Solvents on Rtx®-Wax



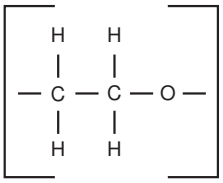
Stabilwax® Columns (fused silica)

(polar phase; Crossbond® polyethylene glycol)

- Most stable polyethylene glycol (PEG) column available.
- Rugged enough to withstand repeated water injections.
- Lowest-bleed PEG column on the market; long column lifetimes.
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

Restek's polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. Because of the increased stability produced by the bonding process, Stabilwax® columns exhibit long column lifetimes, even when programming repeatedly up to 260 °C. The bonding mechanism of the column also produces polar compound retention times that do not shift, as is often observed on other wax-type columns. In addition, this bonding mechanism produces a column that can be rejuvenated by solvent washing. Stabilwax® columns are used for a wide range of compounds and matrices including: FAMEs, flavor compounds, essential oils, solvents, aromatics (including xylene isomers), acrolein/acrylonitrile (EPA 603), and oxygenated compounds. Also used for purity testing of chemicals and analyzing impurities in water matrices and alcoholic beverages.

Stabilwax® Structure



similar phases

HP-INNOWax, CP Wax 52 CB, VF-WAX MS, ZB-WAXplus

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	40 to 250/260 °C	10605	10608	10611
	0.25 µm	40 to 250/260 °C	10620	10623	10626
	0.50 µm	40 to 250/260 °C	10635	10638	10641
0.32 mm	0.25 µm	40 to 250/260 °C	10621	10624	10627
	0.50 µm	40 to 250/260 °C	10636	10639	10642
	1.00 µm	40 to 240/250 °C	10651	10654	10657
0.53 mm	0.25 µm	40 to 250/260 °C	10622	10625	10628
	0.50 µm	40 to 250/260 °C	10637	10640	10643
	1.00 µm	40 to 240/250 °C	10652	10655	10658
	1.50 µm	40 to 230/240 °C	10666	10669	10672
	2.00 µm	40 to 220/230 °C	10667	10670	

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831
0.18 mm	0.18 µm	40 to 250 °C		40602

Six columns for the price of five!

Call 800-356-1688, ext. 4, or your Restek representative for details!

also available

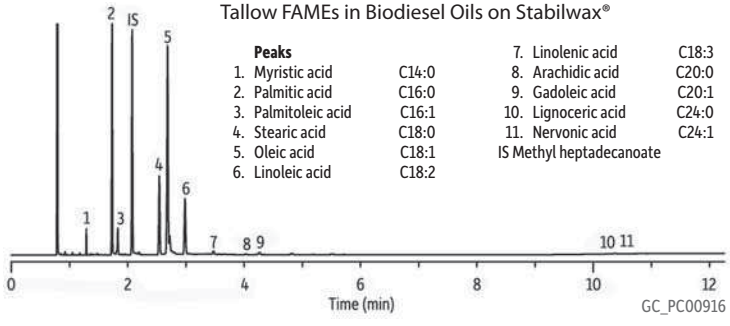
Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-WAX columns .....page 96

FAMEs in Biodiesel Oils on Stabilwax®

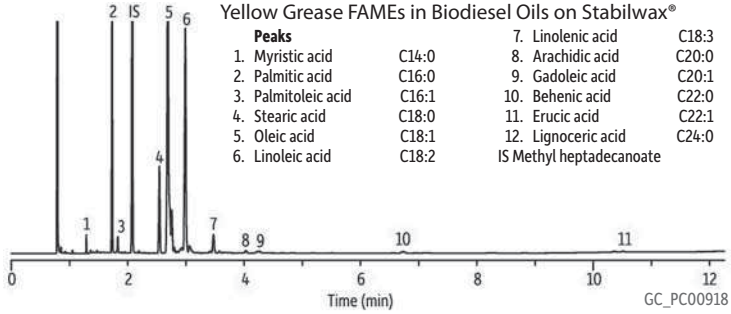
Tallow FAMEs in Biodiesel Oils on Stabilwax®



GC_PC00916

Peaks			
1. Myristic acid	C14:0	7. Linolenic acid	C18:3
2. Palmitic acid	C16:0	8. Arachidic acid	C20:0
3. Palmitoleic acid	C16:1	9. Gadoleic acid	C20:1
4. Stearic acid	C18:0	10. Lignoceric acid	C24:0
5. Oleic acid	C18:1	11. Nervonic acid	C24:1
6. Linoleic acid	C18:2	IS Methyl heptadecanoate	

Yellow Grease FAMEs in Biodiesel Oils on Stabilwax®



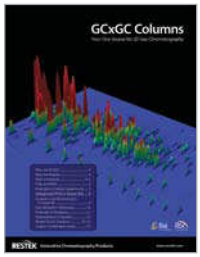
GC_PC00918

Peaks			
1. Myristic acid	C14:0	7. Linolenic acid	C18:3
2. Palmitic acid	C16:0	8. Arachidic acid	C20:0
3. Palmitoleic acid	C16:1	9. Gadoleic acid	C20:1
4. Stearic acid	C18:0	10. Behenic acid	C22:0
5. Oleic acid	C18:1	11. Erucic acid	C22:1
6. Linoleic acid	C18:2	12. Lignoceric acid	C24:0
		IS Methyl heptadecanoate	

Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Various sources of biodiesel (B100), prepared according to European Method EN 14103
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Cyclosplitter® (cat.# 20706)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Linear Velocity:	60 cm/sec
Detector	FID @ 250 °C

See page 656 for Soy FAMEs and Rapeseed FAMEs analysis.

Restek GCxGC Columns: Your One Source for 2D Gas Chromatography



free literature

GCxGC Columns: Your One Source for 2D Gas Chromatography

Download your free copy from **www.restek.com**

lit. cat.# GNBR1585-UNV

Why Use GCxGC?

GCxGC is a powerful multidimensional GC technique that combines two independent separations to accurately analyze highly complex samples. GCxGC involves two columns with differing stationary phase selectivity (orthogonal) that are press-fitted together in series and separated by a modulator. The first (primary) column performs an initial separation, and its effluent is continually focused and "injected" in defined cycles by the modulator onto the second (secondary) column, where another separation occurs. By choosing a secondary column that is orthogonal (has different selectivity) to the primary column, it is possible to separate and identify analytes that cannot be separated by the primary column. And, by keeping the secondary column very short, it is possible to maintain the separation produced by the primary column. Results generated through a series of high-speed chromatograms are plotted as a contour plot, sometimes known as a retention plane (Figure 1).

So, why use GCxGC? Because comprehensive two-dimensional gas chromatography allows you to perform separations that are simply not possible using standard one-dimensional chromatography!

Why Use Restek GCxGC Columns?

- Wide range of stationary phases offers orthogonal separations.
- High thermal stability increases system ruggedness.
- Unrivaled column inertness for accurate analysis of active compounds.
- 0.15, 0.18, and 0.25 mm ID formats accommodate varying sample capacities, speeds, and detectors.
- Secondary columns come in convenient 2 m lengths for economical methods development.

Restek has been performing comprehensive two-dimensional gas chromatography since its commercial inception. Our Innovations lab boasts multiple instruments dedicated to GCxGC applications, and we are continually exploring new application areas—including environmental, food safety, petroleum, forensics, fragrance, natural products, tobacco, metabolomics, and dietary supplements.

Restek's GCxGC secondary columns can be matched with any Restek Rtx® or Rxi® primary column to create the perfect orthogonal separation for your application. See our combination guide below for help choosing your GCxGC columns. We also offer a range of complementary GC accessories—including Sky® inlet liners, the Restek Electronic Leak Detector, and Press-Tight® connectors—to boost your success with GCxGC.

To order Restek GCxGC columns and accessories, see **page 52**.

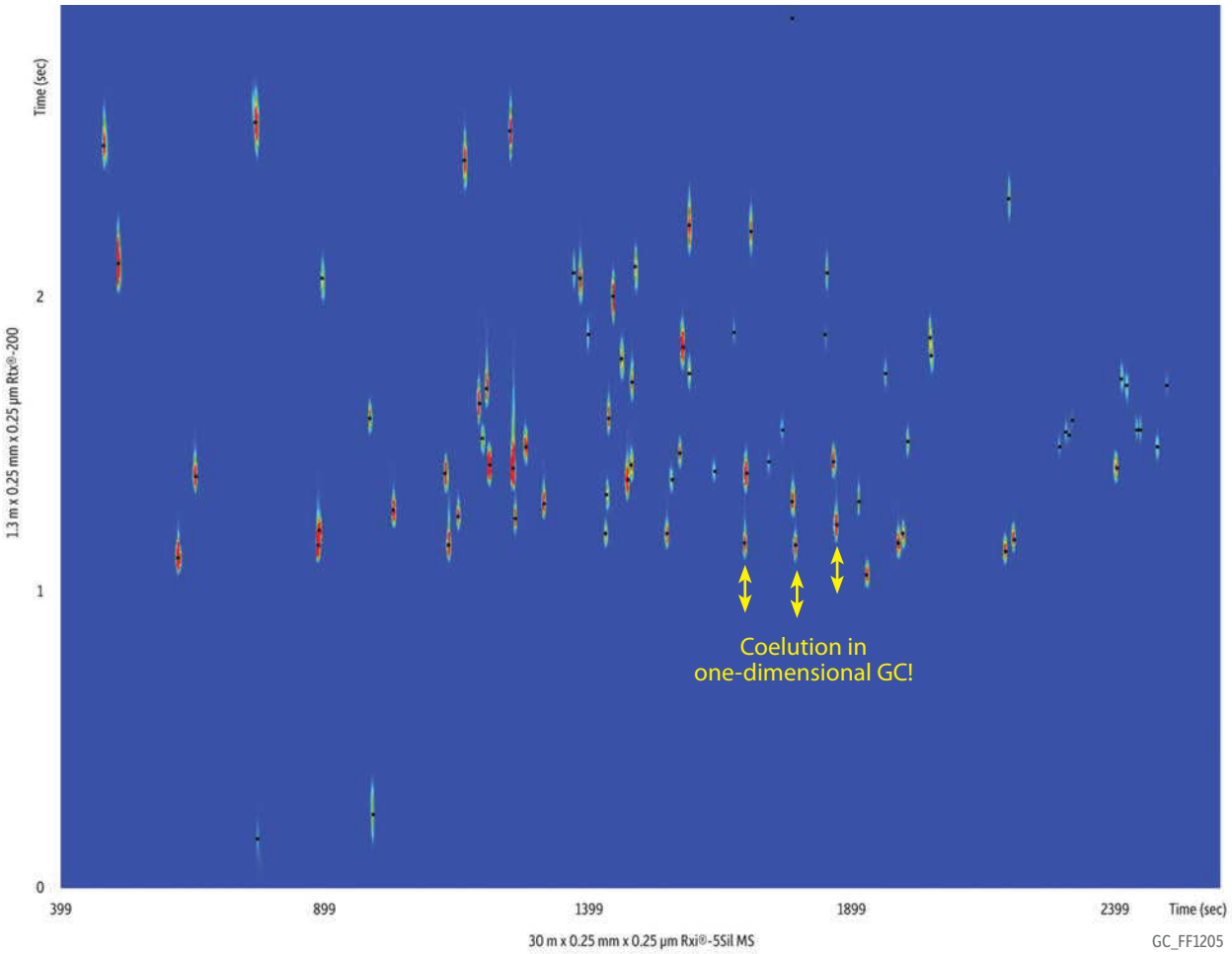
To get additional assistance in choosing a column pair, visit **www.restek.com/gcxgc**

Restek GCxGC Column Combination Guide

To achieve ideal results in a GCxGC analysis, it is imperative that your primary and secondary columns feature orthogonal phases capable of producing differing separations. Use the chart below to find the perfect combination of Restek columns to maximize the effectiveness of your GCxGC system.

	Primary Column		Secondary Column	
Application Area	**Phase**	**Selectivity**	**Phase**	**Selectivity**
Petrochemical	Rxi®-1ms	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
Petrochemical	Rxi®-5Sil MS	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
PAHs, environmental	Rxi®-17Sil MS	Midpolar, aromatic selective	Rxi®-1ms	Nonpolar
PAHs, environmental	Rxi®-17Sil MS	Midpolar, aromatic selective	Rxi®-5Sil MS	Nonpolar
PCBs, PBDEs, PAHs, environmental	Rxi®-XLB	Nonpolar	Rxi®-17Sil MS	Midpolar, aromatic selective
Mono-ortho, coplanar PCBs	Rxi®-1ms	Nonpolar	Rxi®-XLB	Planar selective
Mono-ortho, coplanar PCBs	Rxi®-5Sil MS	Nonpolar	Rxi®-XLB	Planar selective
Pesticides, nitroaromatics, halogenated compounds	Rxi®-1ms	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Pesticides, nitroaromatics, halogenated compounds	Rxi®-5Sil MS	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Pesticides, nitroaromatics, halogenated compounds	Rxi®-XLB	Nonpolar	Rtx®-200	Midpolar, electronegative selectivity
Flavors, fragrances	Rxi®-1ms	Nonpolar	Stabilwax®	Polar
Flavors, fragrances	Rxi®-5Sil MS	Nonpolar	Stabilwax®	Polar
Flavors, fragrances	Stabilwax®	Polar	Rxi®-1ms	Nonpolar
Flavors, fragrances	Stabilwax®	Polar	Rxi®-5Sil MS	Nonpolar

Figure 1: In a contour plot like this one showing clear determination of over 80 pesticides in marijuana, the x-axis represents the primary column retention time and the y-axis represents the secondary column retention time. Peaks aligned along the y-axis would coelute in one-dimensional GC, which is especially problematic if they cannot then be separated by MS.



Column: Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); Rtx®-200 1.3 m, 0.25 mm ID, 0.25 µm (cat.# 15020); **Sample**: Diluent: Toluene; **Injection**: Inj. Vol.: 1 µL splitless (hold 1 min); Liner: Sky® 4 mm single taper w/wool (cat.# 23303.1); Inj. Temp.: 250 °C; Purge Flow: 40 mL/min; **Oven**: Oven Temp: Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 5 °C/min; Rtx®-200: 85 °C (hold 1 min) to 315 °C at 5 °C/min; **Carrier Gas**: He, corrected constant flow (2 mL/min); **Modulation**: Modulator Temp. Offset: 20 °C; Second Dimension Separation Time: 3 sec; Hot Pulse Time: 0.9 sec; Cool Time between Stages: 0.6 sec; **Detector**: TOFMS; Transfer Line Temp.: 290 °C; Analyzer Type: TOF; Source Temp.: 225 °C; Electron Energy: 70 eV; Mass Defect: -20 mu/100 u; Solvent Delay Time: 5 min; Tune Type: PFTBA; Ionization Mode: EI; Acquisition Range: 45-550 amu; Spectral Acquisition Rate: 100 spectra/sec; **Instrument**: LECO Pegasus 4D GCxGC-TOFMS; **Notes**: Rtx®-200 (cat.# 15020) is a 15 m column. A 1.3 m section was used as the second dimension column.

For a peak list, visit **www.restek.com** and enter chromatogram GC_FF1205 in the search function.

ChromaBLOGraphy

Check out the Restek blog for the most current topics in GCxGC.

blog.restek.com

To choose the perfect primary/secondary column combination for your application, use our guide on page 50!

To choose the perfect primary/ secondary column combination for your application, use our guide on page 50!

Primary GCxGC Columns (In order of increasing polarity)

Phase	Length	ID	df	temp. limits	cat.#
Rxi-1ms	30 m	0.25 mm	0.25 µm	-60 to 330/350 °C	13323
Rxi-5Sil MS	30 m	0.25 mm	0.25 µm	-60 to 320/350 °C	13623
Rxi-XLB	30 m	0.25 mm	0.25 µm	30 to 340/360 °C	13723
Rxi-17Sil MS	30 m	0.25 mm	0.25 µm	40 to 340/360 °C	14123
Rtx-200	30 m	0.25 mm	0.25 µm	-20 to 320/340 °C	15023
Stabilwax	30 m	0.25 mm	0.25 µm	40 to 250/260 °C	10623

Secondary GCxGC Columns (In order of increasing polarity)

Phase	Length	ID	df	temp. limits	cat.#
Rxi-1ms	2 m	0.15 mm	0.15 µm	-60 to 330/350 °C	15114
	2 m	0.18 mm	0.18 µm	-60 to 330/350 °C	15120
	2 m	0.25 mm	0.25 µm	-60 to 330/350 °C	15127
Rxi-5Sil MS	2 m	0.15 mm	0.15 µm	-60 to 330/350 °C	15113
	2 m	0.18 mm	0.18 µm	-60 to 330/350 °C	15119
	2 m	0.25 mm	0.25 µm	-60 to 330/350 °C	15126
Rxi-XLB	2 m	0.15 mm	0.15 µm	30 to 340/360 °C	15115
	2 m	0.18 mm	0.18 µm	30 to 340/360 °C	15121
	2 m	0.25 mm	0.25 µm	30 to 340/360 °C	15128
Rxi-17Sil MS	2 m	0.15 mm	0.15 µm	40 to 340/360 °C	15110
	2 m	0.18 mm	0.18 µm	40 to 340/360 °C	15116
	2 m	0.25 mm	0.25 µm	40 to 340/360 °C	15123
Rtx-200	2 m	0.15 mm	0.15 µm	-20 to 320/340 °C	15111
	2 m	0.18 mm	0.18 µm	-20 to 320/340 °C	15117
	2 m	0.25 mm	0.25 µm	-20 to 320/340 °C	15124
Stabilwax	2 m	0.15 mm	0.15 µm	40 to 250/260 °C	15112
	2 m	0.18 mm	0.18 µm	40 to 250/260 °C	15118
	2 m	0.25 mm	0.25 µm	40 to 250/260 °C	15125

GCxGC Secondary Column Selectivity Kits

- Each kit includes one Rxi®-1ms, Rxi®-5Sil MS, Rxi®-17Sil MS, Rtx®-200, Rxi®-XLB, and Stabilwax® column.
- Comprehensive kit simplifies column selection for method developers and frequent GCxGC users alike.
- Included Press-Tight® connectors offer a reliable, hassle-free installation.

Description		qty.	cat.#
GCxGC (0.15 mm) Selectivity Kit		kit	15129
Includes (each product also available separately)			
Rxi-1ms	2 m x 0.15 mm x 0.15 µm	ea.	15114
Rxi-5Sil MS	2 m x 0.15 mm x 0.15 µm	ea.	15113
Rxi-XLB	2 m x 0.15 mm x 0.15 µm	ea.	15115
Rxi-17Sil MS	2 m x 0.15 mm x 0.15 µm	ea.	15110
Rtx-200	2 m x 0.15 mm x 0.15 µm	ea.	15111
Stabilwax	2 m x 0.15 mm x 0.15 µm	ea.	15112
Universal Press-Tight Connectors	Deactivated	5-pk.	20429

Description		qty.	cat.#
GCxGC (0.18 mm) Selectivity Kit		kit	15130
Includes (each product also available separately)			
Rxi-1ms	2 m x 0.18 mm x 0.18 µm	ea.	15120
Rxi-5Sil MS	2 m x 0.18 mm x 0.18 µm	ea.	15119
Rxi-XLB	2 m x 0.18 mm x 0.18 µm	ea.	15121
Rxi-17Sil MS	2 m x 0.18 mm x 0.18 µm	ea.	15116
Rtx-200	2 m x 0.18 mm x 0.18 µm	ea.	15117
Stabilwax	2 m x 0.18 mm x 0.18 µm	ea.	15118
Universal Press-Tight Connectors	Deactivated	5-pk.	20429

Description		qty.	cat.#
GCxGC (0.25 mm) Selectivity Kit		kit	15131
Includes (each product also available separately)			
Rxi-1ms	2 m x 0.25 mm x 0.25 µm	ea.	15127
Rxi-5Sil MS	2 m x 0.25 mm x 0.25 µm	ea.	15126
Rxi-XLB	2 m x 0.25 mm x 0.25 µm	ea.	15128
Rxi-17Sil MS	2 m x 0.25 mm x 0.25 µm	ea.	15123
Rtx-200	2 m x 0.25 mm x 0.25 µm	ea.	15124
Stabilwax	2 m x 0.25 mm x 0.25 µm	ea.	15125
Universal Press-Tight Connectors	Deactivated	5-pk.	20429

Shorten Analysis Time and Boost Productivity With Restek Fast GC Columns

The math is simple: The less time it takes to perform each analysis, the more samples your laboratory can process. The easiest way to reduce analysis time while still maintaining resolution of critical compounds is to use hydrogen as your carrier gas. If hydrogen is not an option, or if you already use it and want to go even faster, turn to the higher resolving power of smaller-bore capillary columns from Restek.

As column ID decreases, column efficiency (i.e., plates/meter) increases, allowing you to achieve the same, or even better, resolution using a shorter length—and significantly less time. Whether you are currently using 0.25 or 0.53 mm ID columns, you can shorten analysis times as much as twofold by switching to Restek 0.15 mm ID fast GC columns. These high-efficiency columns speed up separations on your existing GC or GC-MS instrumentation—while maintaining resolution and meeting method criteria—so you can make more runs per shift with the same exceptional accuracy you've come to expect from Restek.

Fast GC 0.15 mm ID Columns

- Increase productivity up to 2x without sacrificing resolution.
- Compatible with your existing GC setup.
- Low bleed for maximum sensitivity and accurate GC-MS analyses.
- Thick films (up to 2 µm) eliminate loadability issues.
- OD similar to 0.25 mm columns for easy installation.
- Excellent as secondary columns for GCxGC.
- Available in a variety of stationary phases.

tech tip

Use a 20 m fast GC column in place of a standard 30 m column; a 10 m in place of a 15 m; and a 40 m in place of a 60 m.

Rxi®-1ms Columns for Fast GC (fused silica)

(nonpolar phase; Crossbond® dimethyl polysiloxane)

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	-60 to 330/350 °C	43800	43801
	2.0 µm	-60 to 330/350 °C		43802

Rxi®-5Sil MS Columns for Fast GC (fused silica)

(low polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816
	2.0 µm	-60 to 320/350 °C		43817

Rxi®-17Sil MS Columns for Fast GC (fused silica)

(midpolarity Crossbond® phase)

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821

Rtx®-200 Columns for Fast GC (fused silica)

(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	-20 to 320/340 °C	43835	43836

Stabilwax® Columns for Fast GC (fused silica)

(polar phase; Crossbond® polyethylene glycol)

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831

How to Get the Same Chromatogram With a Fast GC Column

For over 20 years, 0.15 mm ID columns have been proven to work in virtually any application field. When switching to a smaller-ID and shorter-length column, there are several things you must do in order for your new, faster method to give you the same chromatogram (i.e., separations) as your old method:

1) Choose a column with the same phase ratio.
2) Adapt the temperature program so that the analyte elution temperatures are the same.
3) Adjust the linear velocity. (For a good starting point, see your column's certificate of analysis.)

Following these guidelines will help ensure that you achieve similar chromatography (i.e., identical elution order and resolution)— in a fraction of the time.

Application-Specific Columns

Unique Column Chemistries for Application-Specific and Specially Deactivated Columns

Designed to help solve chromatographic challenges, these stationary phases are optimized for the best separations, accurate quantification, and shorter analysis times.

Application-Specific Columns

- Clinical, Forensic, and Toxicology
- Environmental
- Foods, Flavors, and Fragrances
- Petroleum and Petrochemical
- Pharmaceutical

Specially Deactivated Columns

Designed for specific classes of compounds.

- Acidic compound analysis.
- Basic compound analysis.
- Chiral analysis.

Blood Alcohol Analysis

Rtx®-BAC Plus 1/Rtx®-BAC Plus 2 Columns

NEW!

- Optimized column selectivities guarantee resolution of ethanol, internal standards, and frequently encountered interferences.
- Robust and reproducible column chemistry ensures longer column lifetime and consistent results.
- 2 minute analysis time increases lab productivity.
- Stable to 260 °C

These application-specific columns for blood alcohol analysis baseline separate all critical compounds—including ethanol, methanol, acetone, *tert*-butanol, acetaldehyde, isopropanol, and *n*-propanol—in less than 2 minutes. Every Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2 column is qualified with a test mix containing these important BAC target compounds to ensure reproducibility.

These columns baseline separate all blood alcohol compounds in blood, breath, or urine, in less than 2 minutes, under isothermal conditions. Isothermal analysis increases productivity by eliminating the need for oven cycling. Confirmation is easily achieved with this tandem set because there are two elution order changes between the columns.

Rtx®-BAC Plus 1 Columns (fused silica)

ID	df	temp. limits	30-Meter
0.32 mm	1.80 µm	-20 to 240/260 °C	18004
0.53 mm	3.00 µm	-20 to 240/260 °C	18005

Rtx®-BAC Plus 2 Columns (fused silica)

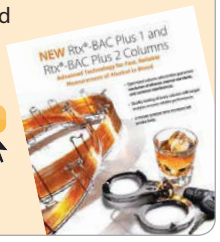
ID	df	temp. limits	30-Meter
0.32 mm	0.6 µm	-20 to 240/260 °C	18006
0.53 mm	1.0 µm	-20 to 240/260 °C	18007

free literature

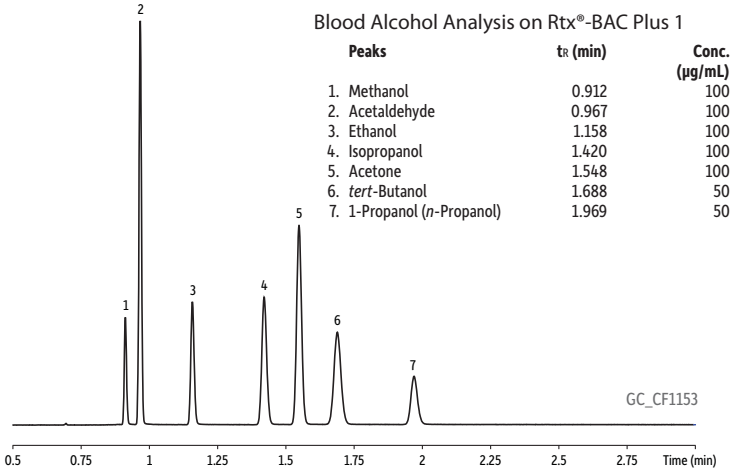
Rtx®-BAC Plus 1 and
Rtx®-BAC Plus 2 Columns
Advanced Technology for Fast, Reliable Measurement of Alcohol in Blood

Download your free copy from
www.restek.com

lit. cat.#
CFBR1538-UNV

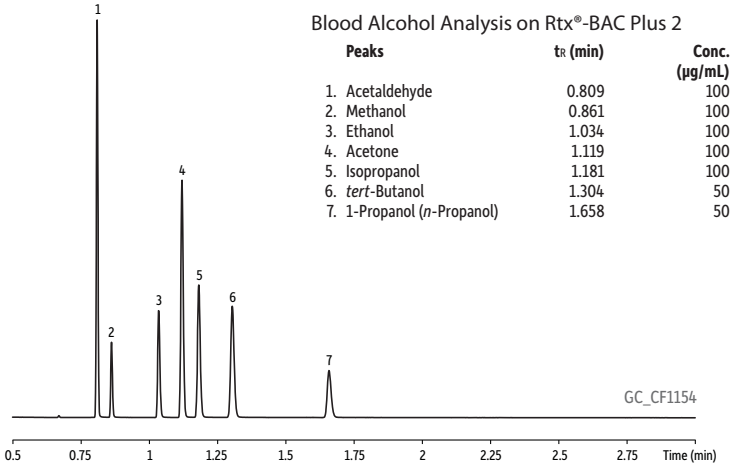


Blood Alcohol Analysis on Rtx®-BAC Plus 1 and Rtx®-BAC Plus 2



Blood Alcohol Analysis on Rtx®-BAC Plus 1

Peaks	t_R (min)	Conc. (µg/mL)
1. Methanol	0.912	100
2. Acetaldehyde	0.967	100
3. Ethanol	1.158	100
4. Isopropanol	1.420	100
5. Acetone	1.548	100
6. *tert*-Butanol	1.688	50
7. 1-Propanol (*n*-Propanol)	1.969	50



Blood Alcohol Analysis on Rtx®-BAC Plus 2

Peaks	t_R (min)	Conc. (µg/mL)
1. Acetaldehyde	0.809	100
2. Methanol	0.861	100
3. Ethanol	1.034	100
4. Acetone	1.119	100
5. Isopropanol	1.181	100
6. *tert*-Butanol	1.304	50
7. 1-Propanol (*n*-Propanol)	1.658	50

Columns	Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004) Rtx®-BAC Plus 2, 30 m, 0.32 mm ID, 0.6 µm (cat.# 18006)
Sample	BAC resolution control standard n-P (cat.# 36010) BAC resolution control standard t-B (cat.# 36011)
Diluent:	Water
Conc.:	50 µL of each standard were diluted in 900 µL water in a 20 mL headspace vial.
Injection	headspace-loop split (split ratio 50:1)
Liner:	1 mm ID straight inlet liner (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	200 °C
Instrument:	Tekmar HT3
Inj. Time:	3 min
Transfer Line Temp.:	125 °C
Valve Oven Temp.:	125 °C
Standby flow rate:	50 mL/min
Sample Temp.:	60 °C
Sample Equil. Time:	5 min
Vial Pressure:	30 psi
Pressurize Time:	1 min
Loop Pressure:	20 psi
Loop Fill Time:	1 min
Oven	
Oven Temp:	40 °C (hold 3 min)
Carrier Gas	He, constant flow
Linear Velocity:	80 cm/sec @ 40 °C
Detector	FID @ 240 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

Table of Contents for
GC Chromatograms
See **page 570.**

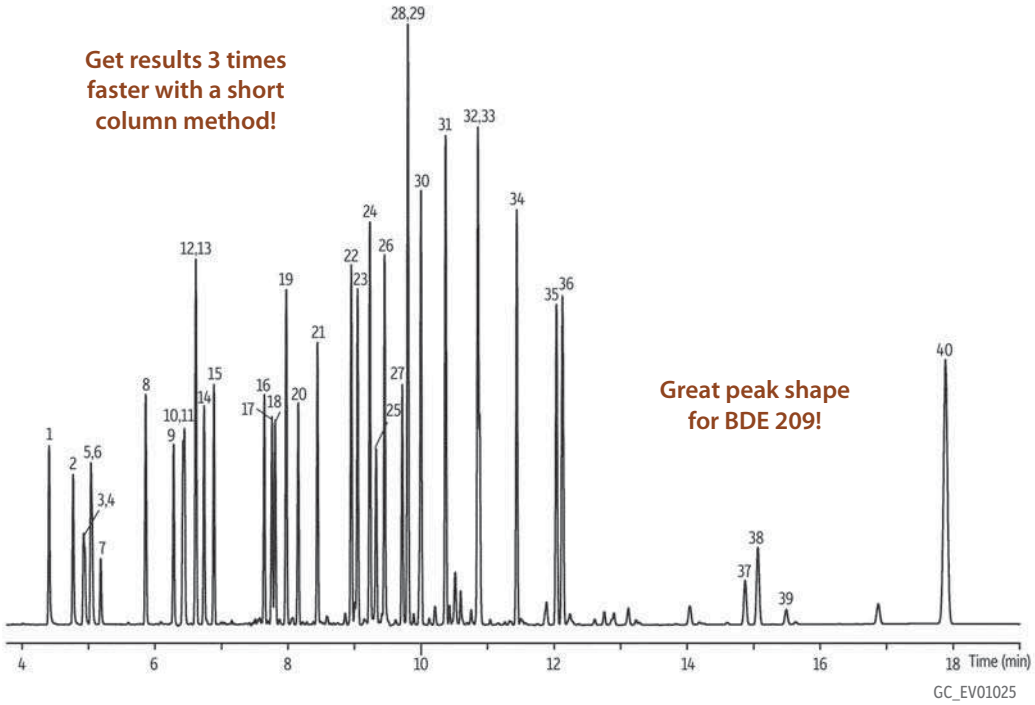
Brominated Flame Retardants Analysis

Rtx®-1614 Columns (fused silica)
(5% phenyl methyl)

- Optimized for PBDE analysis by EPA Method 1614.
- Short column option resolves BDE-209 3 times faster with less thermal breakdown.
- Unique deactivation gives higher BDE-209 response, compared to DB-5HT columns, for greater analytical sensitivity.
- Exceeds EPA Method 1614 resolution criteria for BDE-49 and BDE-71.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.10 µm	-60 to 330/360 °C	10296	10295

Brominated Flame Retardants on Rtx®-1614



Peaks
1. BDE-10
2. BDE-7
3. BDE-8
4. BDE-11
5. BDE-12
6. BDE-13
7. BDE-15
8. BDE-30
9. BDE-32
10. BDE-17
11. BDE-25
12. BDE-28
13. BDE-33
14. BDE-35
15. BDE-37
16. BDE-75
17. BDE-49
18. BDE-71
19. BDE-47
20. BDE-66
21. BDE-77
22. BDE-100
23. BDE-119
24. BDE-99
25. BDE-116
26. BDE-118
27. BDE-85
28. BDE-155
29. BDE-126
30. BDE-154
31. BDE-153
32. BDE-138
33. BDE-166
34. BDE-183
35. BDE-181
36. BDE-190
37. BDE-208
38. BDE-207
39. BDE-206
40. BDE-209

Column	Rtx®-1614, 15 m, 0.25 mm ID, 0.10 µm (cat.# 10296)
Sample	100 - 300 ppb PBDE PAR solution (#EO-5113, Cambridge Isotope Laboratories Inc.) 500 ppb decabromodiphenyl ether (#BDE-209, Wellington Laboratories)
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	4 mm cyclo double gooseneck (cat.# 20896)
Inj. Temp.:	340 °C
Oven	
Oven Temp:	120 °C (hold 1 min) to 275 °C at 15 °C/min to 300 °C at 5 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	60 cm/sec @ 120 °C
Detector	µ-ECD @ 345 °C

Dioxin & Furan Analysis

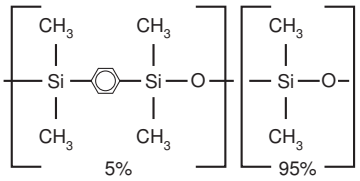
Rxi®-5Sil MS Columns (fused silica)
(low polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low bleed GC-MS column.
- Excellent inertness for active compounds.
- Ideal for use in dual column confirmation of dioxin and furan.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

ID	df	temp. limits	30-Meter	60-Meter
0.18 mm	0.10 µm	-60 to 320/350 °C		43607
0.25 mm	0.25 µm	-60 to 320/350 °C	13623	

Rxi®-5Sil MS Structure

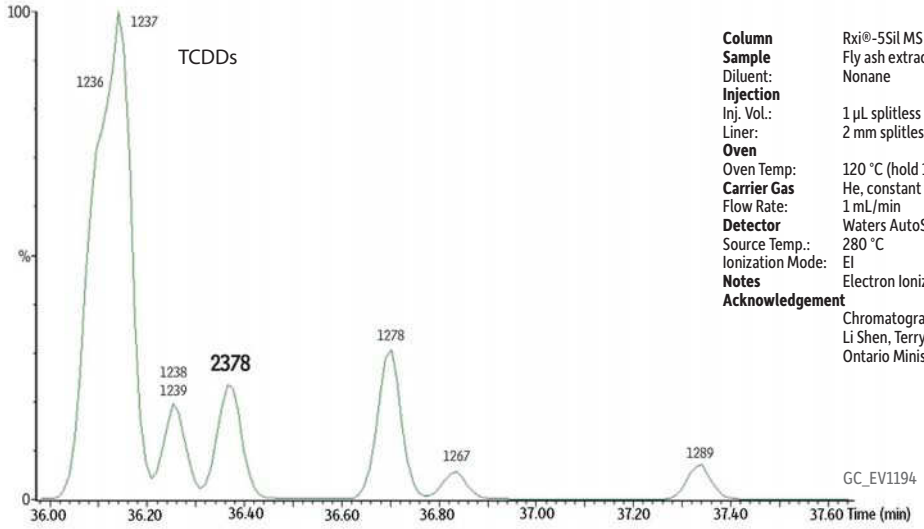


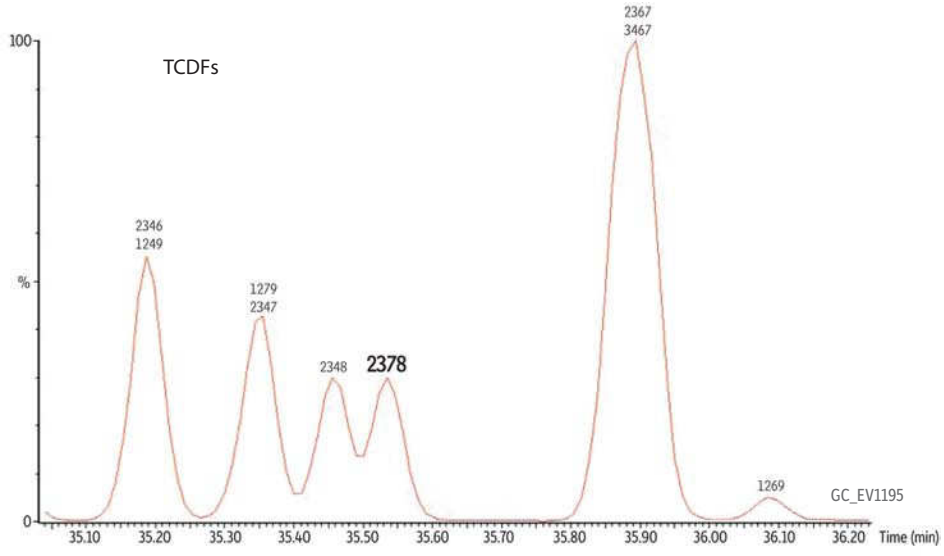
Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, CP-Sil 8 CB, ZB-5msi, Rtx-5Sil MS

Dioxins (TCDDs) and furans (TCDFs) in fly ash on an Rxi®-5Sil MS column





Column	Rxi®-5Sil MS , 60 m, 0.18 mm ID, 0.10 µm (cat.#43607)
Sample	Fly ash extract
Diluent:	Nonane
Injection	
Inj. Vol.:	1 µL splitless
Liner:	2 mm splitless liner (cat.# 20712)
Oven	
Oven Temp:	120 °C (hold 1 min) to 160 °C at 10 °C/min to 300°C at 2.5°C/min
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	Waters AutoSpec Ultima Mass Spectrometer
Source Temp.:	280 °C
Ionization Mode:	EI
Notes	Electron Ionization at 40eV
Acknowledgement	Chromatogram courtesy of Karen MacPherson, Li Shen, Terry Kolic, and Eric Reiner at the Ontario Ministry of the Environment

restek innovation!

Excellent for dioxins or furans.

"Using the Rtx®-Dioxin2 column allowed us to combine EPA 1613 TCDD-only and TCDF confirmation analyses onto one column and one instrument. This resulted in multiple benefits—we shortened run times, reduced instrument downtime and column changes, and increased instrument capacity for our full list samples."

Owen Cosby
Supervisor, HRMS Services
Maxxam Analytics

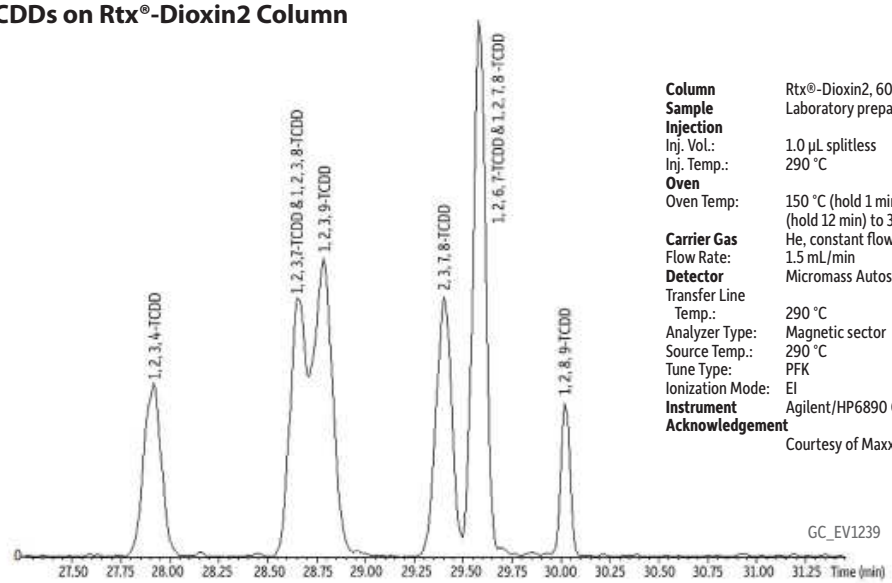
Dioxin & Furan Analysis

Rtx®-Dioxin2 Columns (fused silica)
(proprietary Crossbond® phase)

- Isomer specificity for 2,3,7,8-TCDD and 2,3,7,8-TCDF achieved with one GC column.
- Thermally stable to 340 °C for longer lifetime.
- Unique selectivity for toxic dioxin and furan congeners allows use as a confirmation GC column.

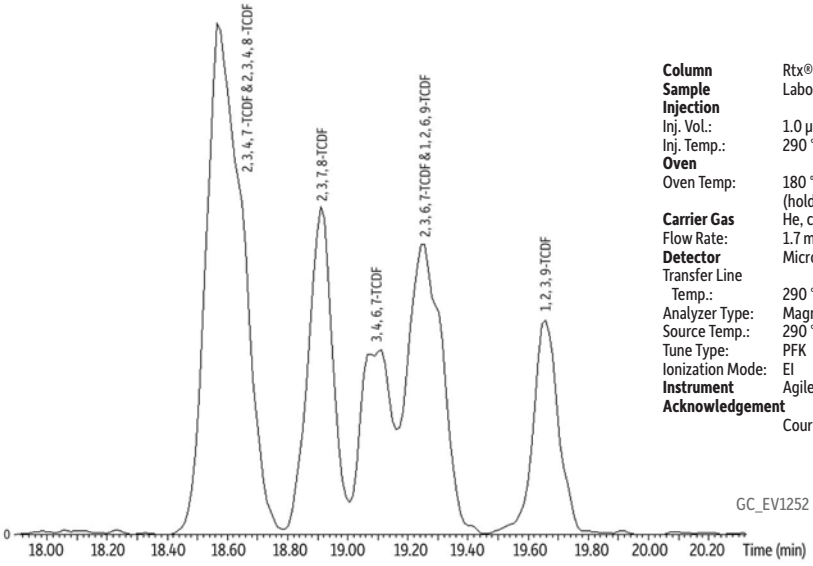
ID	df	temp. limits	40-Meter	60-Meter
0.18 mm	0.18 µm	20°C to 320/340 °C	10759	
0.25 mm	0.25 µm	20°C to 320/340 °C		10758

TCDDs on Rtx®-Dioxin2 Column



Column Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)
Sample Laboratory prepared test mix
Injection
Inj. Vol.: 1.0 µL splitless
Inj. Temp.: 290 °C
Oven
Oven Temp: 150 °C (hold 1 min) to 210 °C at 30 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 12 min) to 330 °C at 70 °C/min (hold 6 min)
Carrier Gas He, constant flow
Flow Rate: 1.5 mL/min
Detector Micromass Autospec Ultima
Transfer Line Temp.: 290 °C
Analyzer Type: Magnetic sector
Source Temp.: 290 °C
Tune Type: PFK
Ionization Mode: EI
Instrument Agilent/HP6890 GC
Acknowledgement
Courtesy of Maxxam Analytics (Ontario, Canada).

TCDFs on Rtx®-Dioxin2 Column



Column Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)
Sample Laboratory prepared test mix
Injection
Inj. Vol.: 1.0 µL splitless
Inj. Temp.: 290 °C
Oven
Oven Temp: 180 °C (hold 1 min) to 235 °C at 45 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 15 min) to 300 °C at 50 °C/min (hold 1 min)
Carrier Gas He, constant flow
Flow Rate: 1.7 mL/min
Detector Micromass Autospec Ultima
Transfer Line Temp.: 290 °C
Analyzer Type: Magnetic sector
Source Temp.: 290 °C
Tune Type: PFK
Ionization Mode: EI
Instrument Agilent/HP6890 GC
Acknowledgement
Courtesy of Maxxam Analytics (Ontario, Canada).

PCB Congeners Analysis

Rtx®-PCB Columns (fused silica)
(proprietary Crossbond® phase)

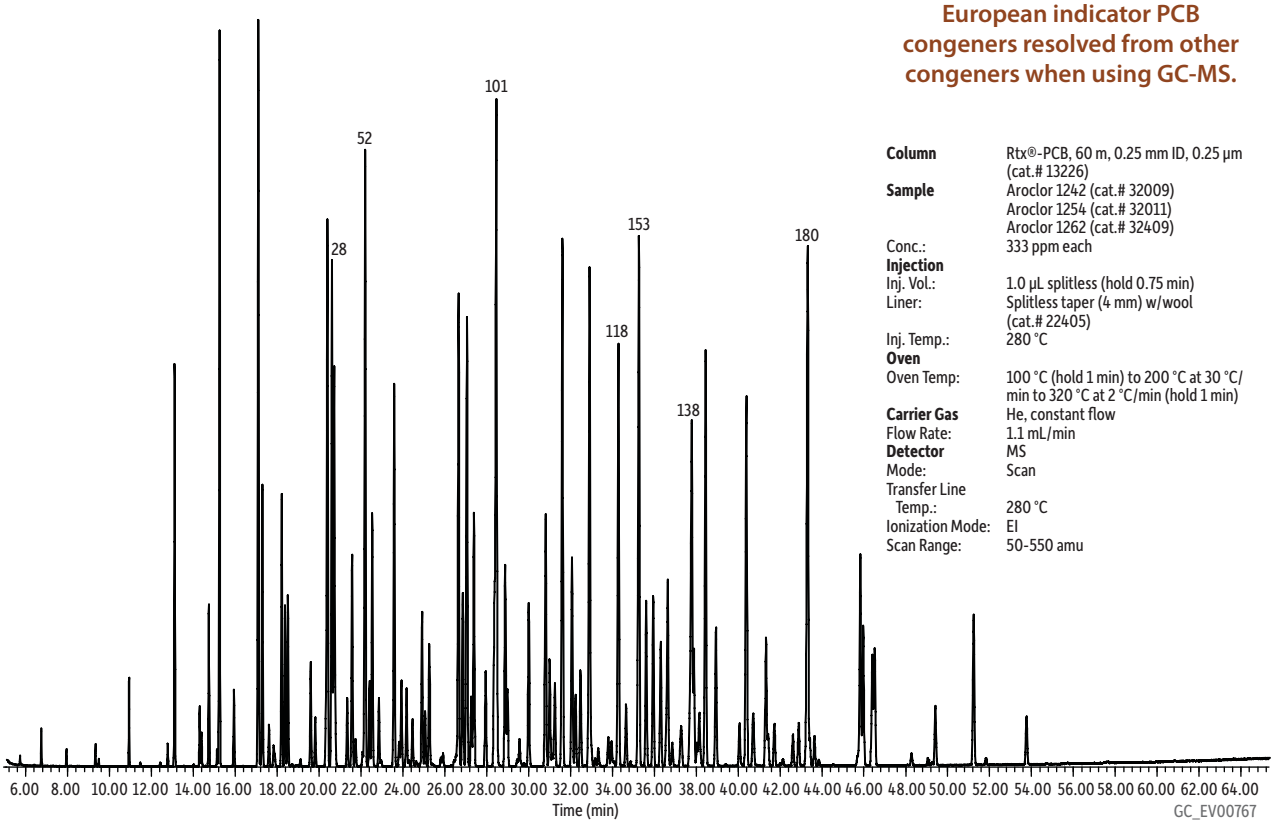
restek innovation!

- Unique polymer for PCBs analysis by GC-ECD or GC-MS.
- Good results for other semivolatiles.
- Low polarity; inert to active compounds.
- Stable to 340 °C.

ID	df	temp. limits*	20-Meter	30-Meter	40-Meter	60-Meter
0.18 mm	0.18 µm	30 °C to 320 °C	41302		41303	41304
0.25 mm	0.25 µm	30 °C to 320/340 °C		13223		13226
0.32 mm	0.50 µm	30 °C to 320/340 °C		13239		

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Aroclor PCBs on Rtx®-PCB



Peaks identified with PCB congener numbers.

European indicator PCB congeners resolved from other congeners when using GC-MS.

Column	Rtx®-PCB, 60 m, 0.25 mm ID, 0.25 µm (cat.# 13226)
Sample	Aroclor 1242 (cat.# 32009) Aroclor 1254 (cat.# 32011) Aroclor 1262 (cat.# 32409)
Conc.:	333 ppm each
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	280 °C
Oven	
Oven Temp:	100 °C (hold 1 min) to 200 °C at 30 °C/min to 320 °C at 2 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.1 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Ionization Mode:	EI
Scan Range:	50-550 amu

similar phases
DB-XLB, VF-Xms, MR1, ZB-XLB

PCB Congeners Analysis

Rxi®-XLB Columns (fused silica)
(low polarity proprietary phase)

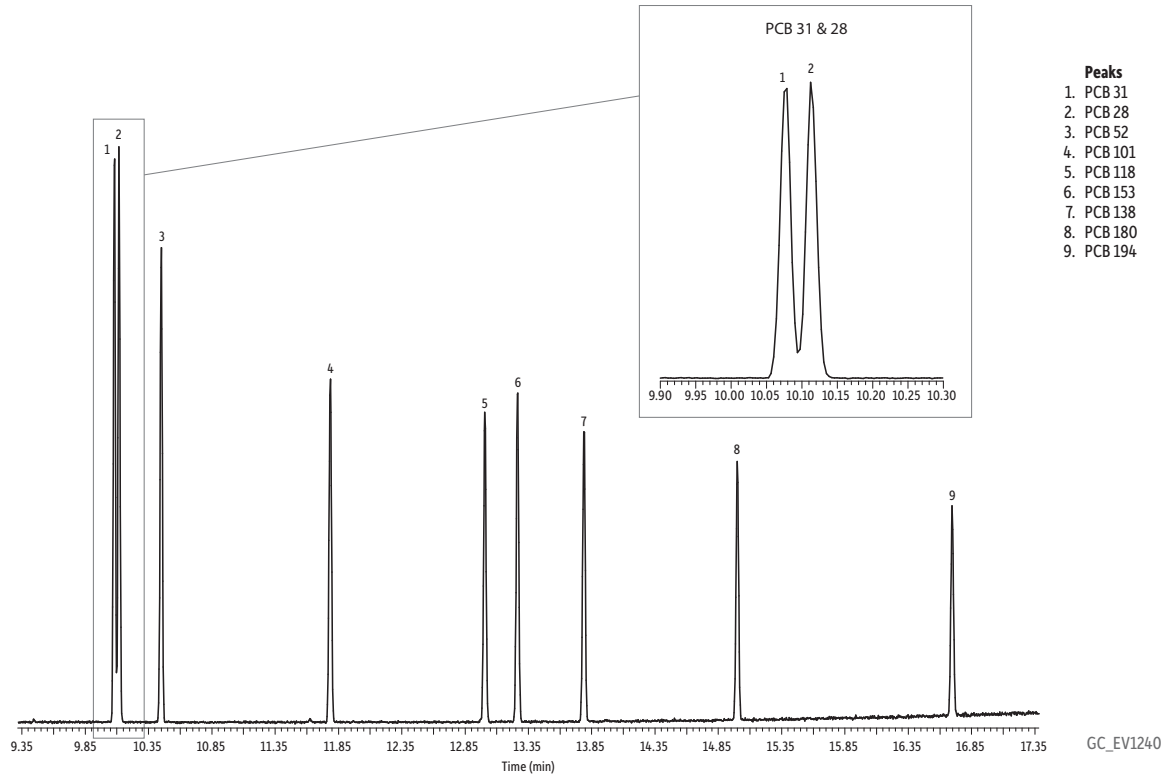
- General-purpose columns exhibiting extremely low bleed. Ideal for many GC-MS applications, including pesticides, PCB congeners (e.g., Aroclor mixes), PAHs.
- Unique selectivity.
- Temperature range: 30 °C to 360 °C.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	30 to 340/360 °C	13705	13708	
	0.25 µm	30 to 340/360 °C	13720	13723	13726
	0.50 µm	30 to 340/360 °C		13738	
	1.00 µm	30 to 340/360 °C		13753	
0.32 mm	0.25 µm	30 to 340/360 °C		13724	13727
	0.50 µm	30 to 340/360 °C		13739	
	1.00 µm	30 to 340/360 °C		13754	
0.53 mm	0.50 µm	30 to 320/360 °C		13740	
	1.50 µm	30 to 320/340 °C	13767	13770	

ID	df	temp. limits	20-Meter
0.18 mm	0.18 µm	30 to 340/360 °C	43702

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

EU PCB Congeners on Rxi®-XLB



Column	Rxi®-XLB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723)	**Carrier Gas**	He, constant flow
Sample	PCB congener standard #2 (cat.# 32294)	Flow Rate:	1 mL/min
	PCB 31 (cat.# custom)	**Detector**	MS
Diluent:	Dichloromethane	Mode:	Scan
Conc.:	3.5 ppm	Transfer Line Temp.:	300 °C
Injection		Analyzer Type:	Quadrupole
Inj. Vol.:	0.5 µL splitless (hold 1.75 min)	Source Temp.:	280 °C
Liner:	2.0 mm ID straight inlet liner w/wool (cat.# 21718)	Electron Energy:	70 eV
Inj. Temp.:	300 °C	Ionization Mode:	EI
Purge Flow:	50 mL/min	Scan Range:	45-550 amu
Oven		Scan Rate:	5 scans/sec
Oven Temp:	40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)	**Instrument**	PE Clarus 500 GC & Clarus 500 MS

Pesticides Analysis (Organophosphorus)

Rtx®-OPPesticides/Rtx®-OPPesticides2

- Application-specific columns for organophosphorus pesticides; best column combination for U.S. EPA Method 8141A.
- Low bleed—ideal for GC-FPD, GC-NPD, or GC-MS analyses.
- Stable to 330 °C.

FAST efficient analysis of OPPs in EPA Method 8141A

Using sophisticated computer modeling software, we created two stationary phases for separating the 53 organophosphorus pesticides (OPP) listed in EPA Method 8141A. Separation is improved and analysis time is significantly reduced compared to other columns. The extended upper temperature limit of these phases (330 °C) allows analysts to bake out high molecular weight contamination typically associated with pesticide samples. The low-bleed columns are a perfect match for sensitive detection systems.

restek innovation!
- Better separations
- Faster analyses

Rtx®-OPPesticides Columns (fused silica)
(proprietary Crossbond® phases)

ID	df	temp. limits	30-Meter
0.32 mm	0.50 µm	-20 to 310/330 °C	11239
0.53 mm	0.83 µm	-20 to 310/330 °C	11240

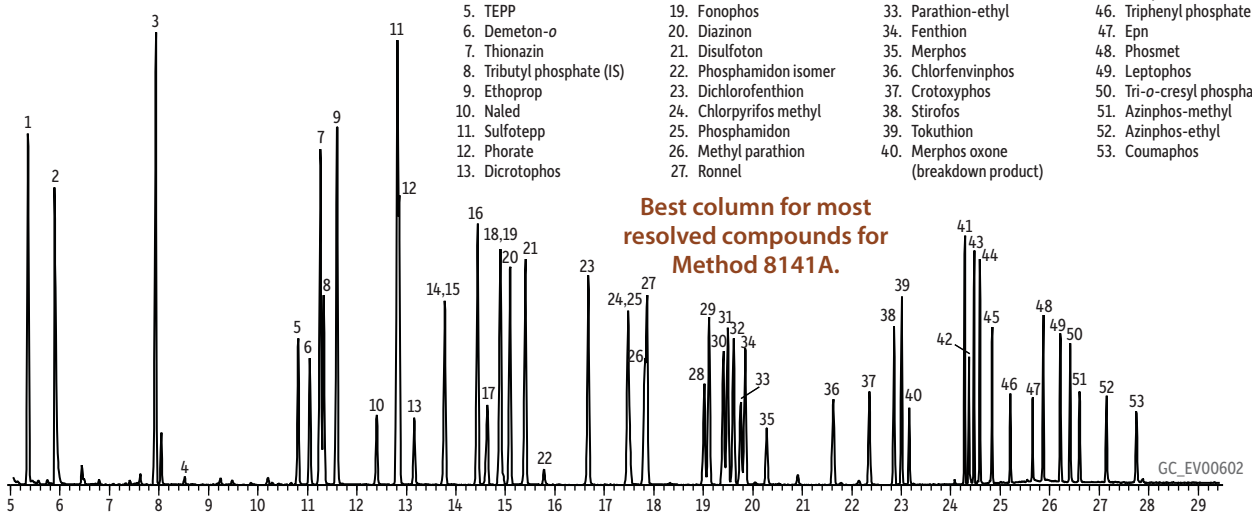
Rtx®-OPPesticides2 Columns (fused silica)
(proprietary Crossbond® phases)

ID	df	temp. limits	20-Meter	30-Meter
0.18 mm	0.20 µm	-20 to 310/330 °C	11244	
0.25 mm	0.25 µm	-20 to 310/330 °C		11243
0.32 mm	0.32 µm	-20 to 310/330 °C		11241
0.53 mm	0.50 µm	-20 to 300/330 °C		11242

Organophosphorus Pesticides U.S. EPA Method 8141A on Rtx®-OPPesticides2

Peaks
1. Dichlorvos
2. Hexamethylphosphoramide
3. Mevinphos
4. Trichlorfon
5. TEPP
6. Demeton-*o*
7. Thionazin
8. Tributyl phosphate (IS)
9. Ethoprop
10. Naled
11. Sulfotepp
12. Phorate
13. Dicrotophos
14. Demeton-S
15. Monocrotophos
16. Terbufos
17. Dimethoate
18. Dioxathion
19. Fonophos
20. Diazinon
21. Disulfoton
22. Phosphamidon isomer
23. Dichlorofenthion
24. Chlorpyrifos methyl
25. Phosphamidon
26. Methyl parathion
27. Ronnel
28. Fenitrothion
29. Aspon
30. Malathion
31. Chlorpyrifos
32. Trichloronate
33. Parathion-ethyl
34. Fenthion
35. Merphos
36. Chlorfenvinphos
37. Crotoxyphos
38. Stirofos
39. Tokuthion
40. Merphos oxone (breakdown product)
41. Ethion
42. Fensulfothion
43. Bolstar
44. Carbophenothion
45. Famphur
46. Triphenyl phosphate (SS)
47. Epn
48. Phosmet
49. Leptophos
50. Tri-*o*-cresyl phosphate
51. Azinphos-methyl
52. Azinphos-ethyl
53. Coumaphos

Best column for most resolved compounds for Method 8141A.



Column	Rtx®-OPPesticides2, 30 m, 0.25 mm ID, 0.25 µm (cat.# 11243)
Sample	Triphenylphosphate (cat.# 32281) Tributylphosphate (cat.# 32280) 8140/8141 OP pesticide calibration mix A (cat.# 32277) 8141 OP pesticide calibration mix B (cat.# 32278)
Conc.:	100 ppm (100 ng on-column)
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.4 min)
Liner:	Double taper splitless (4 mm) (cat.# 20785)
Inj. Temp.:	250 °C
Oven	
Oven Temp.:	80 °C (hold 0.5 min) to 140 °C at 20 °C/min to 210 °C at 4 °C/min (hold 1 min) to 280 °C at 30 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	1.0 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Ionization Mode:	EI
Scan Range:	35-400 amu
Notes	U.S. EPA Method 8141A custom standard mix. Additional mixes not shown. Contact Restek for more information.

restek innovation!

- Very low bleed provides highest sensitivity.
- Faster analysis time with full separation of chlorinated pesticides.

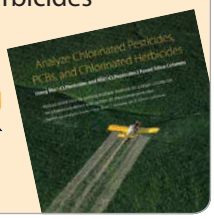
CarboPrep®
SPE Cartridges
See page 376.

free literature

Analyze Chlorinated Pesticides, PCBs and Chlorinated Herbicides

Download your free copy from **www.restek.com**

lit. cat.# EVFL1013



Pesticides Analysis (Chlorinated)

Rtx®-CLPesticides/Rtx®-CLPesticides2

- Application-specific columns for organochlorine pesticides and herbicides.
- Low bleed—ideal for GC-ECD or GC-MS analyses.
- Baseline separations in less than 10 minutes.
- Stable to 340 °C.
- Analyze EPA Method 8081B, 8082A, 8151A, 504.1, 515, 508.1, and 552.2 compounds without time-consuming column change.

Rtx®-CLPesticides Columns (fused silica)

(proprietary Crossbond® phases)

ID	df	temp. limits	15-Meter	20-Meter	30-Meter	60-Meter
0.18 mm	0.18 µm	-60 to 320/340 °C		42102		
0.25 mm	0.25 µm	-60 to 320/340 °C	11120		11123	11126
0.32 mm	0.32 µm	-60 to 320/340 °C			11141	
	0.50 µm	-60 to 320/340 °C	11136		11139	
0.53 mm	0.50 µm	-60 to 300/320 °C	11137		11140	

Rtx®-CLPesticides2 Columns (fused silica)

(proprietary Crossbond® phases)

ID	df	temp. limits	10-Meter	15-Meter	20-Meter	30-Meter	60-Meter
0.18 mm	0.14 µm	-60 to 320/330 °C	42301		42302		
0.25 mm	0.20 µm	-60 to 320/340 °C				11323	11326
0.32 mm	0.25 µm	-60 to 320/340 °C		11321		11324	
	0.50 µm	-60 to 320/340 °C				11325	
0.53 mm	0.42 µm	-60 to 300/320 °C		11337		11340	

Purchase one of these recommended combinations of guard and analytical columns and save money.

kit

Rtx®-CLPesticides Column Kit (0.25 mm ID)

(Note: Columns are not preconnected in this kit.)

Rtx-CLPesticides Kit (0.25 mm ID) cat.# 11199 (kit)

Includes:	cat.#
30m, 0.25mm ID, 0.25µm Rtx-CLPesticides Column Column	11123
30m, 0.25mm ID, 0.20µm Rtx-CLPesticides2 Column Column	11323
Universal Angled "Y" Press-Tight Connector, Deactivated	20403-261
5 m, 0.25 mm ID Siltek Guard Column	10026

kit

Rtx®-CLPesticides Column Kit (0.32 mm ID)

(Note: Columns are not preconnected in this kit.)

Rtx-CLPesticides Kit (0.32 mm ID) cat.# 11196 (kit)

Includes:	cat.#
30m, 0.32mm ID, 0.32µm Rtx-CLPesticides Column Column	11141
30m, 0.32mm ID, 0.25µm Rtx-CLPesticides2 Column Column	11324
Universal Angled "Y" Press-Tight Connector, Deactivated	20403-261
5 m, 0.32 mm ID Siltek Guard Column	10027

kit

Rtx®-CLPesticides Column Kit (0.53 mm ID)

(Note: Columns are not preconnected in this kit.)

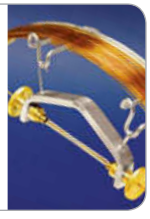
Rtx-CLPesticides Kit (0.53 mm ID) cat.# 11197 (kit)

Includes:	cat.#
30m, 0.53mm ID, 0.50µm Rtx-CLPesticides Column Column	11140
30m, 0.53mm ID, 0.42µm Rtx-CLPesticides2 Column Column	11340
Universal Angled "Y" Press-Tight Connector, Deactivated	20403-261
5m, 0.53mm ID IP Deactivated Guard Column	10045

also available

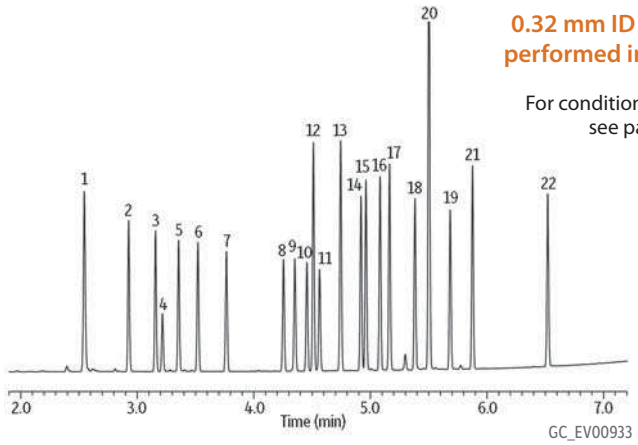
Column connectors

See **pages 208–214** for a wide selection.



Organochlorine Pesticide Mix AB #2 on Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.32 mm ID column set)

Rtx®-CLPesticides

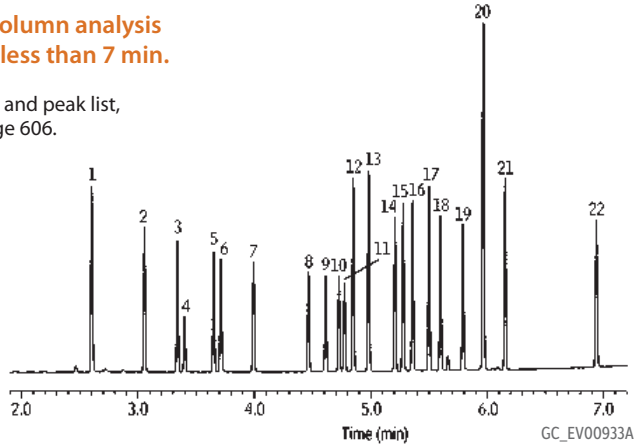


GC_EV00933

0.32 mm ID column analysis performed in less than 7 min.

For conditions and peak list, see page 606.

Rtx®-CLPesticides2



GC_EV00933A

EPA Method	Column Pair	Analysis Time (min)	Coelutions	Restek Advantage
8081B (Organochlorine pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	7 / 7	0 / 0	• Increase sample throughput with 7 min analyses and baseline resolution.
	DB-35ms / DB-XLB	7 / 8	0 / 1	
	ZB-MR1 / ZB-MR2	10 / 9	0 / 0	
8081B (extended) (Organochlorine pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	24 / 23	1 / 2	• Best balance of speed and selectivity. • All compounds are resolved between both columns.
	DB-35ms / DB-XLB	27 / 28	2 / 3	
	ZB-MR1 / ZB-MR2	NDP / 16	NDP / 3	
8082A (Polychlorinated biphenyls [PCBs], Aroclors)	Rtx-CLPesticides / Rtx-CLPesticides2	7 / 7	0 / 0	• Fast PCB analysis times.
	DB-35ms / DB-XLB	6 / 7	0 / 0	
	ZB-MR1 / ZB-MR2	24 / 21	0 / 0	
8151A (Chlorinated herbicides)	Rtx-CLPesticides / Rtx-CLPesticides2	13 / 13	1 / 0	• More elution order changes improve confidence in confirmational results.
	DB-35ms / DB-XLB	12 / 13	0 / 0	
	ZB-MR1 / ZB-MR2	16 / 15	1 / 1	
504.1 (EDB, DBCP, TCP)	Rtx-CLPesticides / Rtx-CLPesticides2	6 / 6	0 / 0	• Reliably separate analytes from trihalomethane interferences.
	DB-35ms / DB-XLB	6 / 6	0 / 0	
	ZB-MR1 / ZB-MR2	NDP	NDP	
505 (Organohalide pesticides)	Rtx-CLPesticides / Rtx-CLPesticides2	18 / 18	1 / 1	• All compounds resolved between both columns.
	DB-35ms / DB-XLB	14 / 14	0/ 1	
	ZB-MR1 / ZB-MR2	35/ 36	1 /2	
508.1 (Chlorinated pesticides, herbicides, organohalides)	Rtx-CLPesticides / Rtx-CLPesticides2	23 / 24	2 / 2	• Best overall balance of speed and resolution.
	DB-35ms / DB-XLB	22 / 24	2 / 4	
	ZB-MR1 / ZB-MR2	18 / 17	2 / 4	
552.2 (Haloacetic acids, dalapon)	Rtx-CLPesticides / Rtx-CLPesticides2	12 / 12	0 / 0	• No coelutions—get accurate results for compounds that coelute on other columns.
	DB-35ms / DB-XLB	8 / 9	2 / 1	
	ZB-MR1 / ZB-MR2	NDP/10	NDP/1	

Comparison based on published competitor data. All columns tested were 0.32 mm ID. NDP = no data published

How much time do column changes cost you?

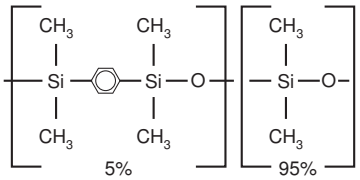
Switch to Rtx®-CLPesticides columns and analyze pesticides, herbicides, PCBs and more on a single column set.

did you know?

Analyzing dirty or derivatized samples can contaminate your column. Restek does not recommend analyzing trace-level pesticide samples following derivatized samples.

Polycyclic Aromatic Hydrocarbons (PAHs) Analysis

Rxi®-5Sil MS Structure

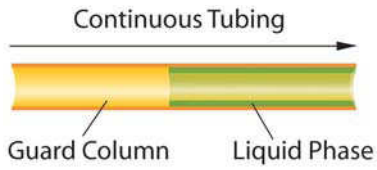


Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, CP-Sil 8 CB, ZB-5msi, Rtx-5Sil MS

Integra-Guard® Built-In Guard Column



Get the protection without the connection!
See **page 25** for Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns.

Rxi®-5Sil MS Columns (fused silica)

(low polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

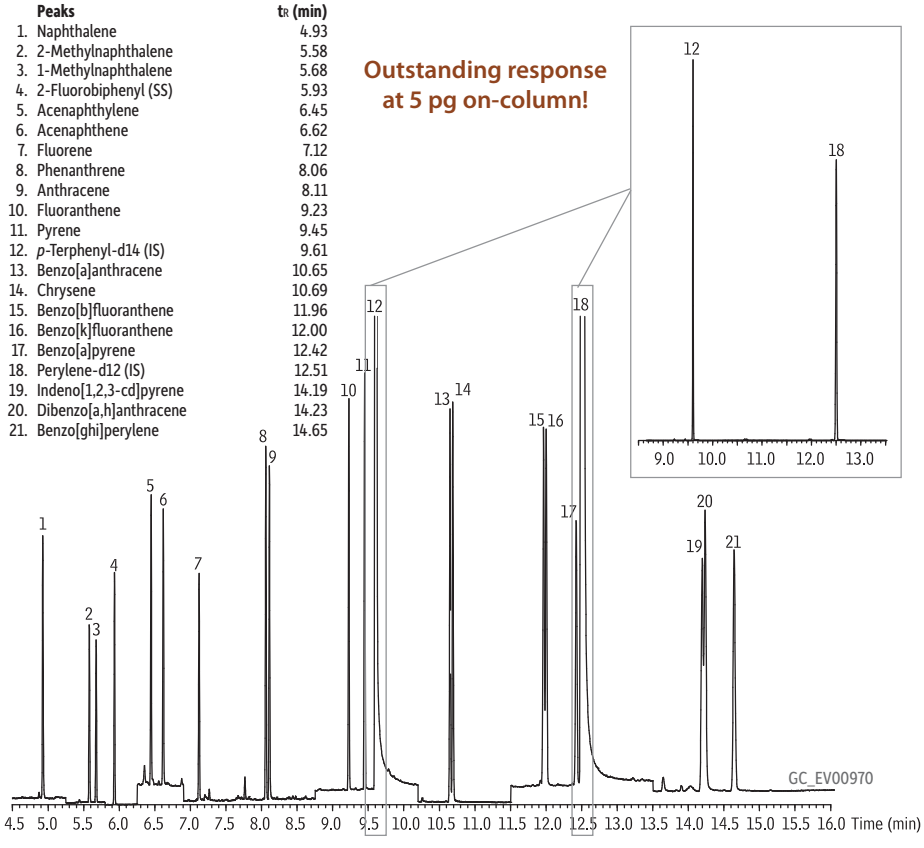
- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter	60-Meter
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

Polycyclic Aromatic Hydrocarbons on Rxi®-5Sil MS

	Peaks	t_R (min)
1.	Naphthalene	4.93
2.	2-Methylnaphthalene	5.58
3.	1-Methylnaphthalene	5.68
4.	2-Fluorobiphenyl (SS)	5.93
5.	Acenaphthylene	6.45
6.	Acenaphthene	6.62
7.	Fluorene	7.12
8.	Phenanthrene	8.06
9.	Anthracene	8.11
10.	Fluoranthene	9.23
11.	Pyrene	9.45
12.	*p*-Terphenyl-d14 (IS)	9.61
13.	Benzo[a]anthracene	10.65
14.	Chrysene	10.69
15.	Benzo[b]fluoranthene	11.96
16.	Benzo[k]fluoranthene	12.00
17.	Benzo[a]pyrene	12.42
18.	Perylene-d12 (IS)	12.51
19.	Indeno[1,2,3-cd]pyrene	14.19
20.	Dibenzo[a,h]anthracene	14.23
21.	Benzo[ghi]perylene	14.65



Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	PAH mix, 1 µL of 0.005 µg/mL (IS 2 µg/mL) SV Calibration mix #5 / 610 PAH Mix (cat.# 31011) 1-Methylnaphthalene (cat.# 31283) 2-Methylnaphthalene (cat.# 31285) 2-Fluorobiphenyl (cat.# 31091)
Conc.:	5 pg on-column
Injection	
Inj. Vol.:	1.0 µL pulsed splitless (hold 0.15 min)
Liner:	Drilled Uniliner® (hole near top) w/wool (cat.# 21055-200.5)
Inj. Temp.:	300 °C
Pulse Pressure:	20 psi (137.9 kPa)
Pulse Time:	0.2 min
Purge Flow:	60 mL/min
Oven	
Oven Temp:	50 °C (hold 0.5 min) to 290 °C at 25 °C/min to 320 °C at 5 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1.4 mL/min
Detector	MS
Mode:	SIM
SIM Program:	

Start Time Group (min)	Ion(s)	Dwell (ms)
1	128 m/z	100
2	142 m/z	100
3	172 m/z	100
4	152 m/z	100
5	166 m/z	100
6	178 m/z	100
7	202,244 m/z	100
8	228 m/z	100
9	252,264 m/z	100
10	276,278 m/z	100

Transfer Line Temp.:	290 °C
Ionization Mode:	EI

Polycyclic Aromatic Hydrocarbons (PAHs) Analysis

Rxi®-17Sil MS Columns (fused silica)
(midpolarity Crossbond® phase)

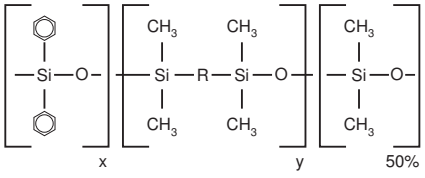
- 340/360 °C upper temperature limits.
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Equivalent to USP phase G3.
- Low bleed for use with sensitive detectors, such as MS.
- Excellent separation of EU-PAHs, including fluoranthenes.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	40 to 340/360 °C	14120	14123	14126
0.32 mm	0.25 µm	40 to 340/360 °C	14121	14124	

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	40 to 340/360 °C	43820	43821
0.18 mm	0.18 µm	40 to 340/360 °C		14102
	0.36 µm	40 to 340/360 °C		14111

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Rxi®-17Sil MS Structure



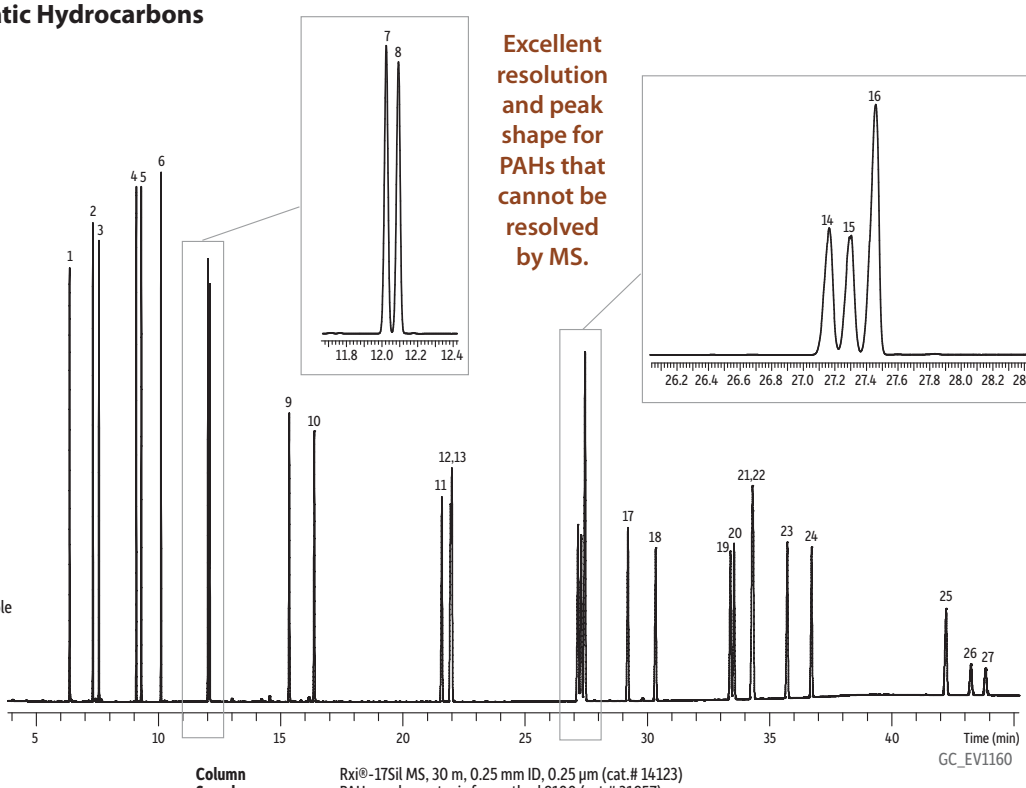
Similar to: (50%-phenyl)-methylpolysiloxane

similar phases

DB-17ms, VF-17ms, CP-Sil 24 CB, ZB-50

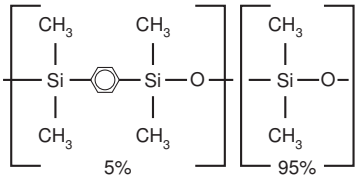
Polycyclic Aromatic Hydrocarbons on Rxi®-17Sil MS

Peaks
1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benz[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fluoranthene
15. Benzo[k]fluoranthene
16. Benzo(j)fluoranthene
17. Benzo[a]pyrene
18. 3-Methylcholanthrene
19. Dibenz(a,h)acridine
20. Dibenz[a,j]acridine
21. Indeno[1,2,3-cd]pyrene
22. Dibenz[a,h]anthracene
23. Benzo[ghi]perylene
24. 7H-Dibenzo[c,g]carbazole
25. Dibenzo[a,e]pyrene
26. Dibenzo(a,i)pyrene
27. Dibenzo(a,h)pyrene



Column	Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)
Sample	PAH supplement mix for method 8100 (cat.# 31857) EPA Method 8310 PAH mixture (cat.# 31841) Triphenylene (custom)
Diluent:	Dichloromethane
Conc.:	10 ppm
Injection	
Inj. Vol.:	0.5 µL splitless (hold 1.75 min)
Liner:	Auto SYS XL PSS split/splitless w/wool (cat.# 21718)
Inj. Temp.:	320 °C
Purge Flow:	75 mL/min
Oven	
Oven Temp:	65 °C (hold 0.5 min) to 220 °C at 15 °C/min to 330 °C at 4 °C/min (hold 15 min)
Carrier Gas	He, constant flow
Flow Rate:	2.0 mL/min
Detector	FID @ 320 °C
Instrument	PE Clarus 600 GC
Acknowledgement	Instrument provided by PerkinElmer

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, CP-Sil 8 CB, ZB-5msi, Rtx-5Sil MS

ordering note

Get the protection without the connection!
For Rxi®-5Sil MS columns with built-in Integra-Guard® guard columns, see **page 25**.

The Rxi®-5Sil MS column is recommended for U.S. EPA Method 8270.

Semivolatiles Analysis

Rxi®-5Sil MS Columns (fused silica)
(low polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

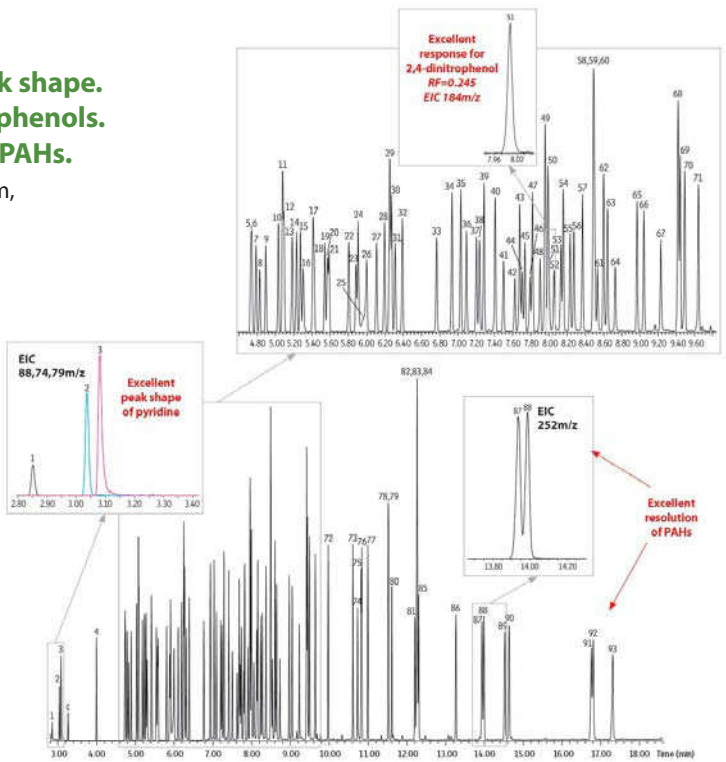
ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter	60-Meter
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

Semivolatiles by EPA Method 8270 on Rxi®-5Sil MS (30 m, 0.25 mm ID, 0.25 µm) w/Drilled Uniliner® Inlet Liner.

- **Excellent pyridine peak shape.**
- **Excellent response for phenols.**
- **Excellent resolution of PAHs.**

For complete chromatogram, see page 33.



GC_EV00943

Volatile Organics Analysis

Rtx®-VMS Columns (fused silica)
(proprietary Crossbond® phase)

- Application-specific columns for volatile organic pollutants by GC-MS.
- Complete separation of U.S. EPA Method 8260B compounds in less than 10 minutes.
- Stable to 260 °C.
- No known equivalent phases.

Rtx®-VMS columns offer lower bleed, better selectivity, and overall faster analysis for separating volatile organic compounds, such as those listed in U.S. EPA Method 8260B. The Rtx®-VMS stationary phase is a highly stable polymer that provides outstanding analysis of volatile compounds in combination with sensitive ion traps and Agilent 5973 mass spectrometers. 0.18 and 0.25 mm ID columns allow sample splitting at the injection port, eliminating the added expense and maintenance of a jet separator. A 0.45 mm or 0.53 mm ID column can be directly connected to the purge-and-trap transfer line in a system equipped with a jet separator.

ID	df	temp. limits	30-Meter	60-Meter	75-Meter
0.25 mm	1.40 µm	-40 to 240/260 °C	19915	19916	
0.32 mm	1.80 µm	-40 to 240/260 °C	19919	19920	
0.45 mm	2.55 µm	-40 to 240/260 °C	19908	19909	
0.53 mm	3.00 µm	-40 to 240/260 °C	19985	19988	19974

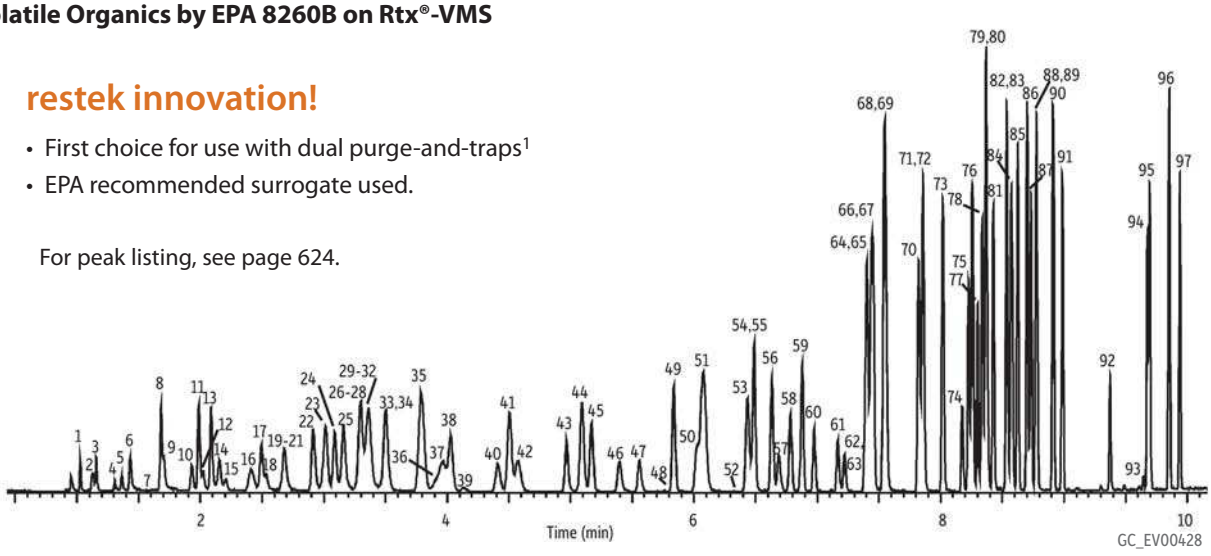
ID	df	temp. limits	20-Meter	40-Meter
0.18 mm	1.00 µm	-40 to 240/260 °C	49914	49915

Volatile Organics by EPA 8260B on Rtx®-VMS

restek innovation!

- First choice for use with dual purge-and-traps[1]
- EPA recommended surrogate used.

For peak listing, see page 624.



Column	Rtx®-VMS, 20 m, 0.18 mm ID, 1.00 µm (cat.# 49914)
Sample	
Diluent:	Water
Conc.:	10 ppb in 5 mL RO water (unless noted); ketones 2.5X
Injection	Purge and trap split (split ratio 40:1)
Liner:	1 mm split (cat.# 20973)
Inj. Temp.:	220 °C
Purge and Trap	
Instrument:	Tekmar LCS 3100
Trap Type:	Vocarb® 3000
Purge:	11 min @ ambient, flow 40 mL/min
Dry Purge:	1 min, flow 40 mL/min
Desorb Preheat Temp.:	245 °C
Desorb:	2 min @ 250 °C, flow 40 mL/min
Bake:	8 min @ 260 °C
Interface Connection:	Injection port
Transfer Line Tubing:	Silcosteel® treated 0.5 3mm ID tubing (cat.# 20595)
Transfer Line Temp.:	120 °C

Oven	
Oven Temp:	50 °C (hold 4 min) to 100 °C at 18 °C/min (hold 0 min) to 230 °C at 40 °C/min (hold 3 min)
Carrier Gas	He, constant flow
Flow Rate:	1.0 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Tune Type:	BFB
Ionization Mode:	EI
Scan Range:	35-300 amu
Instrument	HP6890 GC & 5973 MSD
Notes	For proper flows, adjust retention time of dichlorodifluoromethane to a retention time of 1.03 min @ 50 °C

[1]A.L. Hilling and G. Smith, Environmental Testing & Analysis, 10(3), 15-19, 2001.

Volatile Organics Analysis

similar phase
DB-VRX

Rtx®-VRX Columns (fused silica)
(proprietary Crossbond® phase)

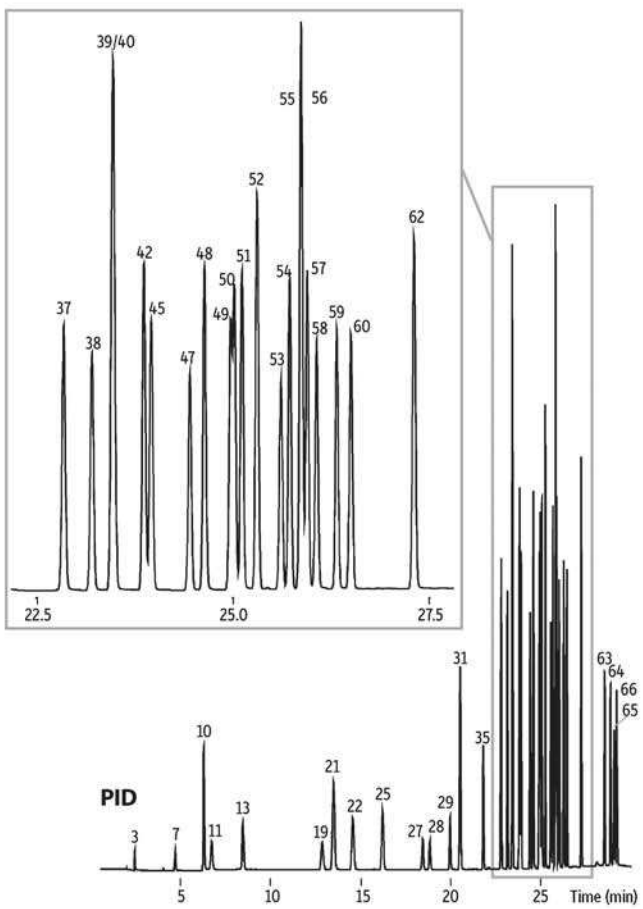
- Application-specific columns for volatile organic pollutants.
- Excellent for U.S. EPA Method 8021 compounds.
- Stable to 260 °C.

The Rtx®-VRX stationary phase and optimized column dimensions provide low bleed, excellent resolution, and fast analysis times for volatile compounds.

ID	df	temp. limits	30-Meter	60-Meter	75-Meter
0.25 mm	1.40 µm	-40 to 240/260 °C	19315	19316	
0.32 mm	1.80 µm	-40 to 240/260 °C	19319	19320	
0.45 mm	2.55 µm	-40 to 240/260 °C	19308		19309
0.53 mm	3.00 µm	-40 to 240/260 °C	19385	19388	

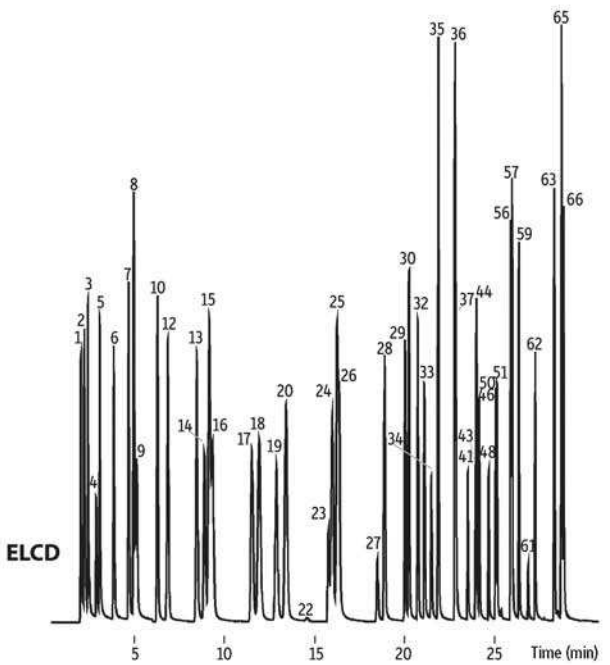
ID	df	temp. limits	20-Meter	40-Meter
0.18 mm	1.00 µm	-40 to 240/260 °C	49314	49315

Volatile Organics by EPA 8021 on Rtx®-VRX



Good choice for wastewater analysis.

For peak list and conditions, visit
www.restek.com
and enter GC_EV00001 in the search.



GC_EV00001

Volatile Organics Analysis

Rtx®-502.2 Columns (fused silica)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns with unique selectivity for volatile organic pollutants. The Rtx®-502.2 column is cited in U.S. EPA Method 502.2 and in many gasoline range organics (GRO) methods for monitoring underground storage tanks.
- Excellent separation of trihalomethanes; ideal polarity for light hydrocarbons and aromatics.
- Stable to 270 °C.

An Rtx®-502.2 column will enable you to quantify all compounds listed in U.S. EPA methods 502.2 or 524.2, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based Rtx®-502.2 stationary phase provides low bleed and thermal stability to 270 °C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling. Narrow bore columns can interface directly in GC/MS systems.

similar phases
DB-502.2

ID	df	temp. limits*	30-Meter	60-Meter	75-Meter	105-Meter
0.25 mm	1.40 µm	-20 to 250/270 °C	10915	10916		
0.32 mm	1.80 µm	-20 to 250/270 °C	10919	10920		10921
0.45 mm	2.55 µm	-20 to 250/270 °C			10986	
0.53 mm	3.00 µm	-20 to 250/270 °C	10908	10909		10910

ID	df	temp. limits	20-Meter	40-Meter
0.18 mm	1.00 µm	-20 to 250/270 °C	40914	40915

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

also available

Metal MXT® Columns

Rugged, flexible, Siltek®-treated stainless steel tubing; inertness comparable to fused silica tubing.

MXT®-502.2 columns .....page 97
MXT®-Volatiles .....page 97

Rtx®-Volatiles Columns (fused silica)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns for volatile organic pollutants.
- Stable to 280 °C.

Rtx®-Volatiles columns were the first columns designed specifically for analyses of the 34 volatile organic pollutants listed in U.S. EPA methods 601, 602, and 624. With these columns, you can quantify all compounds listed in these methods, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based Rtx®-Volatiles stationary phase provides low bleed and thermal stability to 280 °C. Narrow bore columns can interface directly in GC/MS systems.

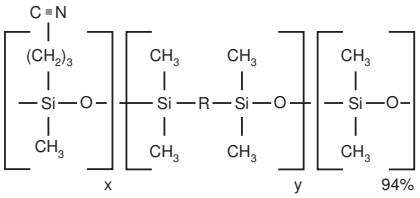
similar phases
VOCOL

ID	df	temp. limits*	30-Meter	60-Meter	105-Meter
0.25 mm	1.00 µm	-20 to 270/280 °C	10900	10903	
0.32 mm	1.50 µm	-20 to 270/280 °C	10901	10904	
0.53 mm	2.00 µm	-20 to 270/280 °C	10902	10905	10906

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Volatile Organics Analysis

Rxi®-624Sil MS Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-624, VF-624ms, CP-Select 624 CB, ZB-624

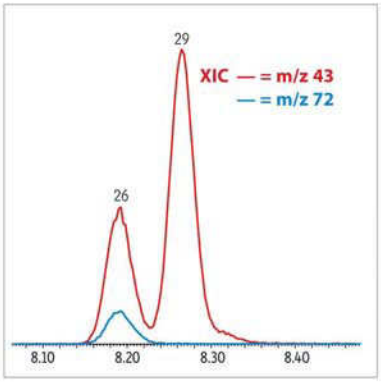
Rxi®-624Sil MS Columns (fused silica)

(midpolarity Crossbond® phase)

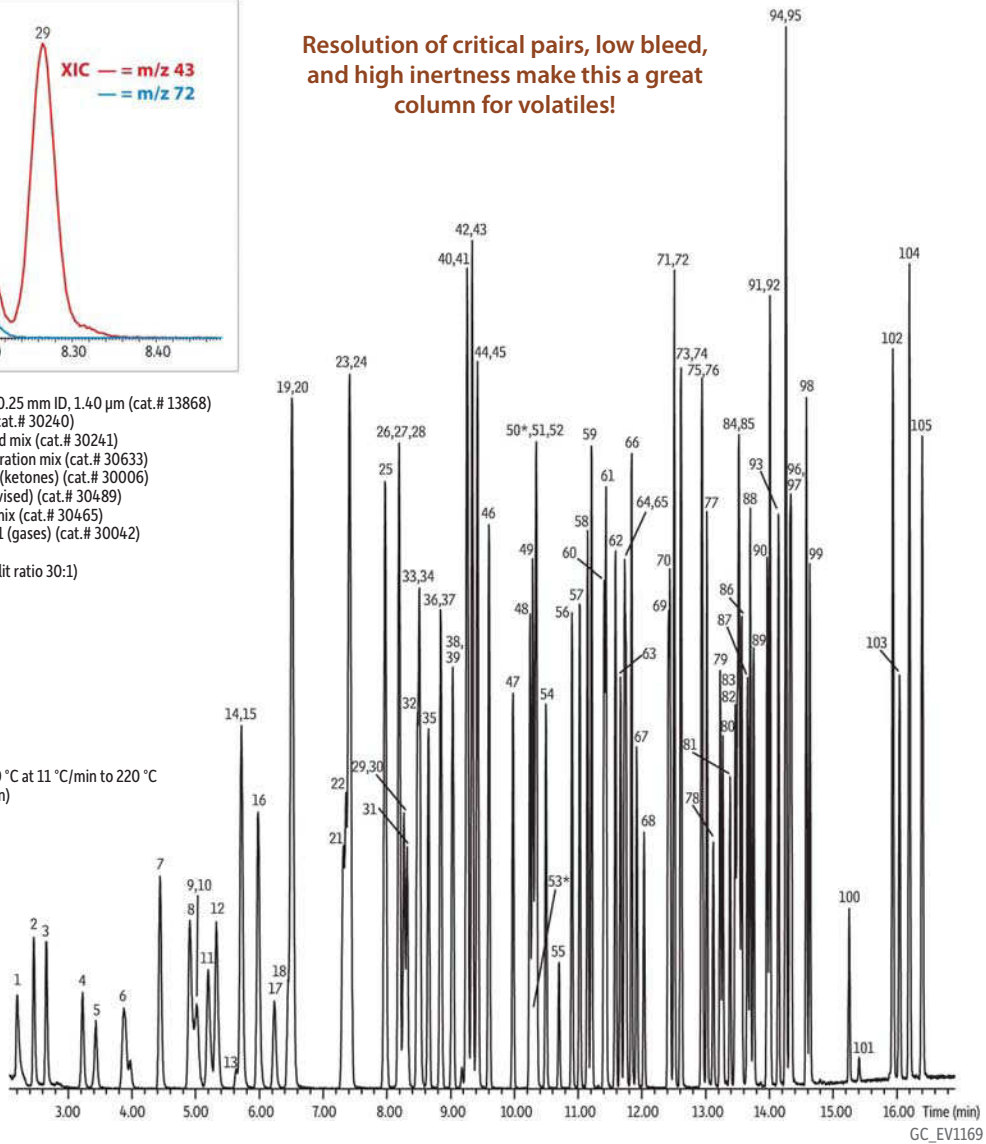
- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

ID	df	temp. limits	20-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)



Resolution of critical pairs, low bleed, and high inertness make this a great column for volatiles!



GC_EV1169

Column	Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)
Sample	8260A surrogate mix (cat.# 30240) 8260A internal standard mix (cat.# 30241) 8260B MegaMix® calibration mix (cat.# 30633) VOA calibration mix #1 (ketones) (cat.# 30006) 8260B acetate mix (Revised) (cat.# 30489) California oxygenates mix (cat.# 30465) 502.2 calibration mix #1 (gases) (cat.# 30042)
Conc.:	25 ppb in RO water
Injection	purge and trap split (split ratio 30:1)
Inj. Temp.:	225 °C
Purge and Trap	
Instrument:	OI Analytical 4660
Trap Type:	10 Trap
Purge:	11 min @ 20 °C
Desorb Preheat Temp.:	180 °C
Desorb:	0.5 min @ 190 °C
Bake:	5 min @ 210 °C
Interface Connection:	injection port
Oven	
Oven Temp:	35 °C (hold 5 min) to 60 °C at 11 °C/min to 220 °C at 20 °C/min (hold 2 min)
Carrier Gas	He, constant flow
Flow Rate:	1.0 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	230 °C
Analyzer Type:	Quadrupole
Source Temp.:	230 °C
Quad Temp.:	150 °C
Electron Energy:	70 eV
Solvent Delay Time:	1.5 min
Tune Type:	BFB
Ionization Mode:	EI
Scan Range:	36-260 amu
Instrument	Agilent 7890A GC & 5975C MSD
Notes	
Other Purge and Trap Conditions:	Sample Inlet: 40 °C Sample: 40 °C Water Management: Purge 110 °C, Desorb 0 °C, Bake, 240 °C
Acknowledgement	Eclipse 4660 purge and trap courtesy of O.I. Analytical, College Station, TX.

For peak listing, see page 622.

FAME Analysis (*cis/trans*)

Rt®-2560 Column (fused silica)
(highly polar phase; biscyanopropyl polysiloxane—not bonded)

- Application-specific column for *cis*/*trans* FAMEs.
- Stable to 250 °C.

Because the Rt®-2560 stationary phase is not bonded, it should not be solvent rinsed.

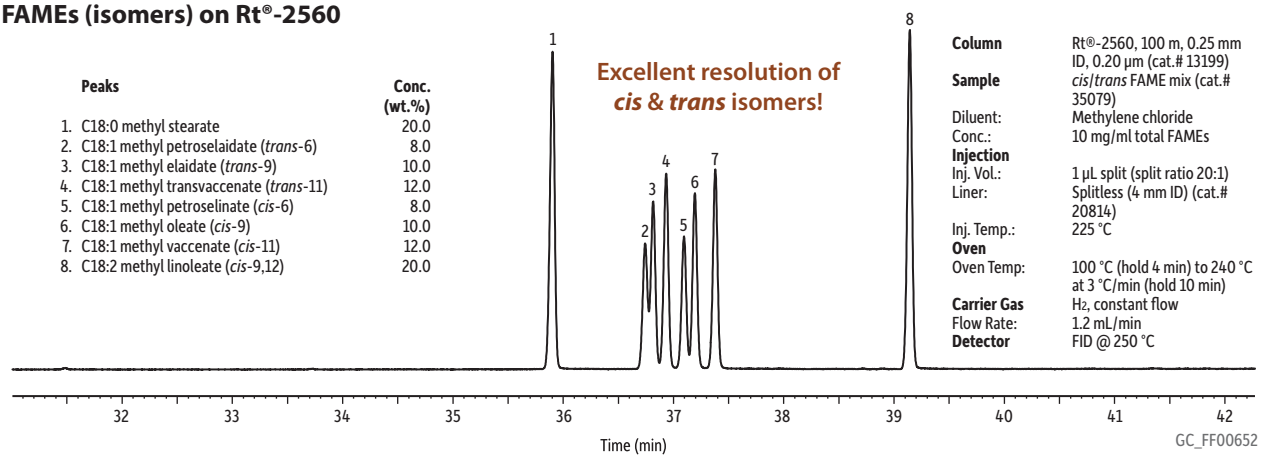
ID	df	temp. limits	100-Meter
0.25 mm	0.20 µm	20 to 250 °C	13199

similar phases

HP-88, CP Sil 88, SPB-2560

FAMEs (isomers) on Rt®-2560

Peaks	Conc. (wt.%)
1. C18:0 methyl stearate	20.0
2. C18:1 methyl petroselaidate (*trans*-6)	8.0
3. C18:1 methyl elaidate (*trans*-9)	10.0
4. C18:1 methyl transvaccenate (*trans*-11)	12.0
5. C18:1 methyl petroselinate (*cis*-6)	8.0
6. C18:1 methyl oleate (*cis*-9)	10.0
7. C18:1 methyl vaccenate (*cis*-11)	12.0
8. C18:2 methyl linoleate (*cis*-9,12)	20.0



Column	Rt®-2560, 100 m, 0.25 mm ID, 0.20 µm (cat.# 13199)
Sample	*cis*/*trans* FAME mix (cat.# 35079)
Diluent:	Methylene chloride
Conc.:	10 mg/ml total FAMEs
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	100 °C (hold 4 min) to 240 °C at 3 °C/min (hold 10 min)
Carrier Gas	H_2, constant flow
Flow Rate:	1.2 mL/min
Detector	FID @ 250 °C

GC_FF00652

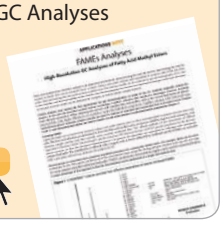
FAME Analysis (Polyunsaturated)

FAMEWAX Columns (USP G16) (fused silica)
(polar phase; Crossbond® polyethylene glycol)

- Application-specific columns for FAMEs, specially tested with a FAME mixture.
- Temperature range: 20 °C to 250 °C.

The elution order of polyunsaturated FAMEs on FAMEWAX columns is comparable to that on other Carbowax® columns, but baseline resolution is achieved in significantly less time.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	20 to 240/250 °C	12497
0.32 mm	0.25 µm	20 to 240/250 °C	12498
0.53 mm	0.50 µm	20 to 250 °C	12499

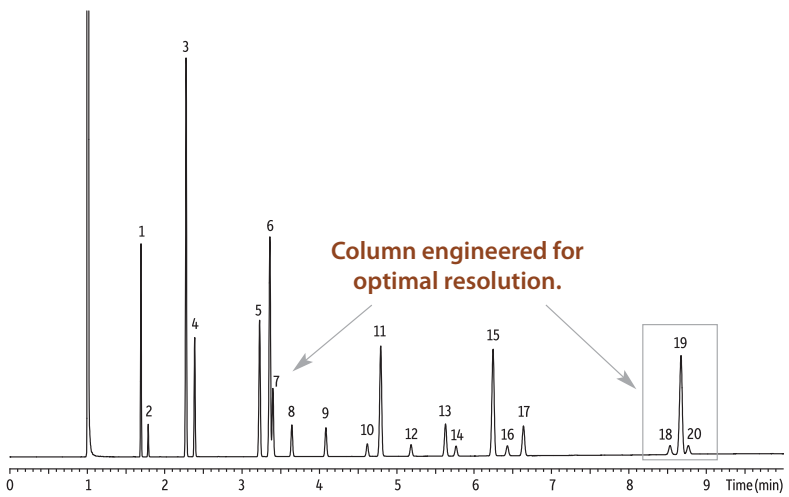


similar phases

Select FAME, Omegawax

FAMEs (Marine Oil Standard) on FAMEWAX

Peaks	Conc. (µg/mL)		
1. C14:0	600	10. C20:0	100
2. C14:1	100	11. C20:1	900
3. C16:0	1,600	12. C20:2	100
4. C16:1	500	13. C20:4	300
5. C18:0	800	14. C20:3	100
6. C18:1 (oleate)	1,300	15. C20:5	1,000
7. C18:1 (vaccenate)	400	16. C22:0	100
8. C18:2	200	17. C22:1	300
9. C18:3	200	18. C24:0	100
		19. C22:6	1,200
		20. C24:1	100



Column	FAMEWAX, 30 m, 0.32 mm ID, 0.25 µm (cat.# 12498)
Sample	Marine oil FAME mix (cat.# 35066)
Diluent:	Isooctane
Conc.:	10,000 µg/mL (total FAMEs; see breakdown in peak list)
Injection	
Inj. Vol.:	1 µL split (split ratio 100:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	195 °C to 240 °C at 5 °C/min (hold 1 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Detector	FID @ 275 °C

GC_FF00499

NEW!

PAHs in Food Analysis

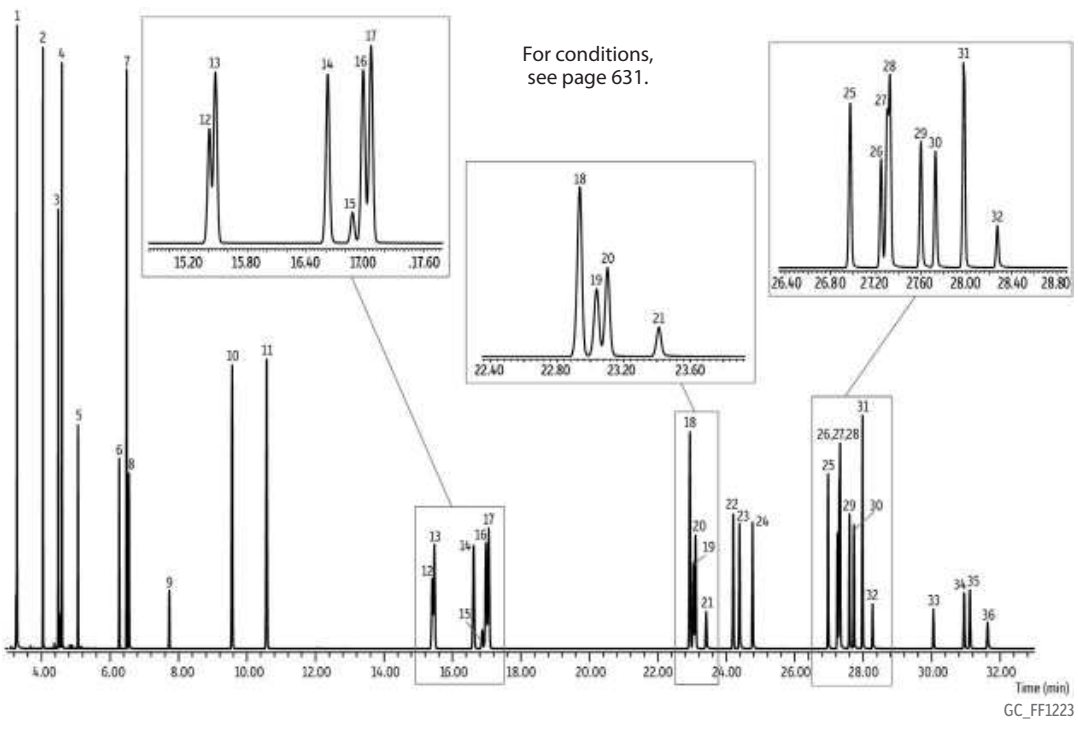
Rxi®-PAH Columns (fused silica)

- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b]fluoranthene, and benzo[a]pyrene.
- Best resolution of chrysene from interfering PAHs, triphenylene and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [j], and [a] fluoranthenes.
- 360 °C thermal stability allows analysis of low volatility dibenzo pyrenes.

The Rxi®-PAH GC columns were designed by Restek with a higher phenyl-content stationary phase that provides unique selectivity to separate important polycyclic aromatic hydrocarbons (PAH) for food safety that cannot be distinguished by mass spectrometry. Even difficult priority compounds, such as the European Food Safety Authority (EFSA) PAH4, are easily separated and accurately quantified, results that cannot be achieved on typical GC columns. Arylene modification and surface bonding of the stationary phase increase thermal stability and ruggedness so relatively non-volatile, higher molecular weight PAHs can be analyzed routinely without interference from column bleed. Excellent column efficiency means that the column can be trimmed for maintenance purposes many times without losing critical PAH separations, including those that are part of environmental methods, as well as food safety testing. The selectivity and efficiency of the Rxi®-PAH column make it ideal for EFSA PAH4 analysis; chrysene/triphenylene separation and resolution of all benzofluoranthenes are easily achieved.

ID	df	temp. limits	30-Meter	40-Meter	60-Meter
0.18 mm	0.07 µm	to 360 °C		49316	
0.25 mm	0.10 µm	to 360 °C	49318		49317

NIST SRM 2260a PAH Mix on Rxi®-PAH



Peaks

1. Naphthalene
2. Biphenyl
3. Acenaphthylene
4. Acenaphthene
5. Fluorene
6. Dibenzothiophene
7. Phenanthrene
8. Anthracene
9. 4H-Cyclopenta[def] phenanthrene
10. Fluoranthene
11. Pyrene
12. Benzo[ghi]fluoranthene
13. Benzo[c]phenanthrene
14. Benz[a]anthracene
15. Cyclopenta[cd]pyrene
16. Triphenylene
17. Chrysene
18. Benzo[b]fluoranthene
19. Benzo[k]fluoranthene
20. Benzo[j]fluoranthene
21. Benzo[a]fluoranthene
22. Benzo[e]pyrene
23. Benzo[a]pyrene
24. Perylene
25. Dibenz[a,j]anthracene
26. Dibenz[a,c]anthracene
27. Indeno[1,2,3-cd]pyrene
28. Dibenz[a,h]anthracene
29. Benzo[b]chrysene
30. Picene
31. Benzo[ghi]perylene
32. Anthanthrene
33. Dibenzo[b,k]fluoranthene
34. Dibenzo[a,e]pyrene
35. Coronene
36. Dibenzo[a,h]pyrene

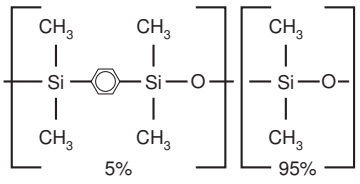
Pesticides in Food Residues Analysis

Rxi®-5Sil MS Columns (fused silica)
(low polarity phase; Crossbond® 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane)

- Engineered to be a low-bleed GC-MS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GC-MS analysis of semivolatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Temperature range: -60 °C to 350 °C.

The Rxi®-5Sil MS stationary phase incorporates phenyl groups in the polymer backbone. This improves thermal stability, reduces bleed, and makes the phase less prone to oxidation. Rxi®-5Sil MS columns are ideal for GC-MS applications requiring high sensitivity, including use in ion trap systems.

Rxi®-5Sil MS Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

DB-5ms, DB-5msUI, VF-5ms, CP-Sil 8 CB, ZB-5msi, Rtx-5Sil MS

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	-60 to 320/350 °C	13605	13608	
	0.25 µm	-60 to 320/350 °C	13620	13623	13626
	0.50 µm	-60 to 320/350 °C	13635	13638	
	1.00 µm	-60 to 320/350 °C	13650	13653	13697
0.32 mm	0.25 µm	-60 to 320/350 °C	13621	13624	
	0.50 µm	-60 to 320/350 °C		13639	
	1.00 µm	-60 to 320/350 °C		13654	
0.53 mm	1.50 µm	-60 to 320/330 °C		13670	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter	60-Meter
0.15 mm	0.15 µm	-60 to 320/350 °C	43815	43816		
	2.0 µm	-60 to 320/350 °C		43817		
0.18 mm	0.10 µm	-60 to 320/350 °C				43607
	0.18 µm	-60 to 320/350 °C		43602	43605	
	0.36 µm	-60 to 320/350 °C		43604		

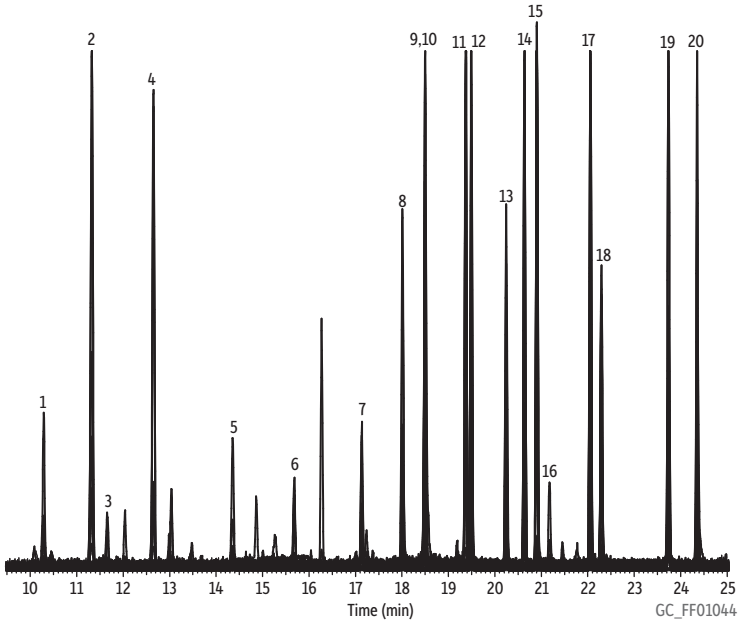
Chlorinated Pesticide Residues in Olive Oil on Rxi®-5Sil MS

Column Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample Olive oil spiked with organochlorine pesticide mix AB # 3 (cat.# 32415)
Conc.: 10 µg/mL
Injection
Inj. Vol.: 1 µL splitless (hold 0.5 min)
Liner: Single taper w/wool (cat.# 22286-200.1)
Inj. Temp.: 225 °C
Oven
Oven Temp.: 130 °C (hold 0.5 min) to 330 °C at 5 °C/min
Carrier Gas He, constant flow
Flow Rate: 1 mL/min
Detector MS
Mode: SIM
Transfer Line Temp.: 320 °C
Ionization Mode: EI
Notes

Extraction and dSPE Cleanup for Pesticide Residues in Olive Oil

Test sample: A 1.5 mL sample of commercially obtained virgin olive oil was spiked with a standard organochlorine pesticide mix. The spiked sample was processed as follows.

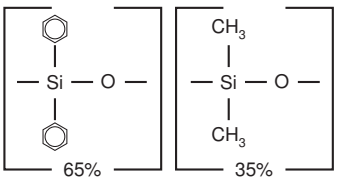
1. Dilute with 1.5 mL hexane.
2. Add 6 mL of acetonitrile (ACN).
3. Mix for 30 minutes on a shaker.
4. Allow layers to separate (approximately 20 minutes), then collect the top (ACN) layer.
5. Repeat the liquid-liquid extraction (steps 2-4) and combine both ACN extract layers.
6. Place 1 mL of the combined ACN extract in a 1.5 mL tube containing 150 mg magnesium sulfate and 50 mg PSA.
7. Shake the tube for 2 minutes.
8. Centrifuge at 3,000 U/min for approximately 5 minutes.
9. Remove the top layer and inject directly into the gas chromatograph system.



For peak list, visit **www.restek.com** and enter GC_FF01044 in the search

Triglycerides in Foods Analysis

Rtx®-65TG Structure



Similar to: (65%-phenyl)-methylpolysiloxane

Rtx®-65TG Columns (fused silica)
(high polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns, specially tested for triglycerides.
- Stable to 370 °C.

The Rtx®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370 °C thermal stability, an Rtx®-65TG column should not be used for the analyses of polar compounds.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.10 µm	40 to 370 °C	17005	17008
0.32 mm	0.10 µm	40 to 370 °C	17006	17009
0.53 mm	0.10 µm	40 to 370 °C	17007	17010

crossbond® technology

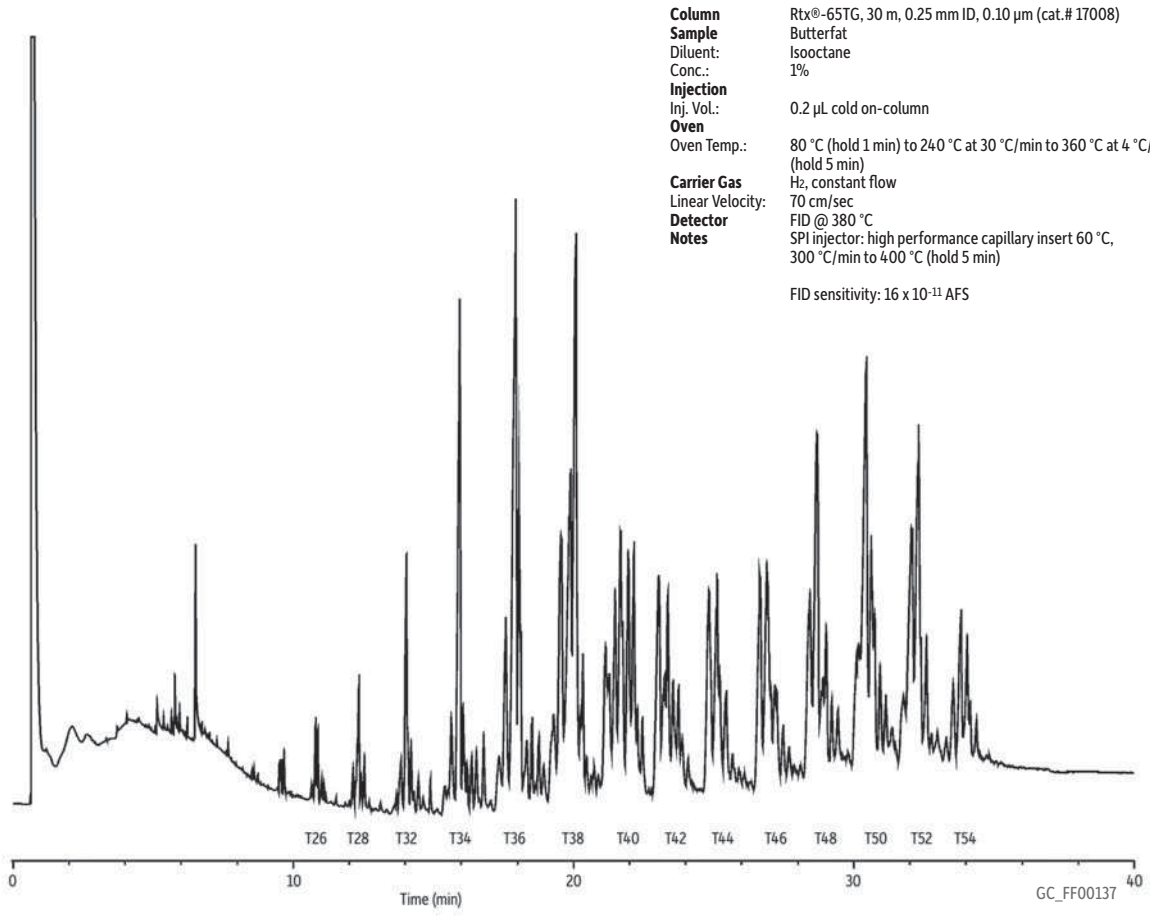
Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

please note

Triglycerides are often injected via on-column injection. Use 0.53 mm retention gaps and appropriate connectors.

- Vu2 Union® connectors (see page 210)
- MXT®-Union connector kits for fused silica (see page 212)

Butter Triglycerides on Rtx®-65TG



Aromatics & Oxygenates in Gasoline Analysis

Rt®-TCEP Columns (fused silica)
(highly polar phase; 1,2,3-tris[2-cyanoethoxy]propane—not bonded)

- General-purpose columns, ideal for aromatics and oxygenates in gasoline.
- Temperature range: 0 °C to 135 °C.

Most gasolines contain aliphatic hydrocarbons up to *n*-dodecane (C12). To improve identification of the aromatics and oxygenates, it is desirable to elute benzene after C11 and toluene after C12. The extremely polar Rt®-TCEP stationary phase provides a retention index for benzene greater than 1,100 and permits the separation of alcohols and aromatics from the aliphatic constituents in gasoline.

Rt®-TCEP columns have the same high polarity as TCEP packed columns (precolumns in ASTM Method D4815 for the analysis of petroleum oxygenates), with the efficiency of a capillary column. The result is a column that can separate a wide variety of compounds with an elution pattern unattainable using other high polarity siloxanes.

The Rt®-TCEP column incorporates a nonbonded stationary phase coated on a surface specialized for enhanced polymer stability and extended column lifetime. Solvent rinsing should be avoided. Conditioning is necessary only if the column is to be used at temperatures near the maximum operating temperature.

ID	df	temp. limits	30-Meter	60-Meter
0.25 mm	0.40 µm	0 to 135 °C	10998	10999

similar phases

SPB-TCEP, CP-TCEP

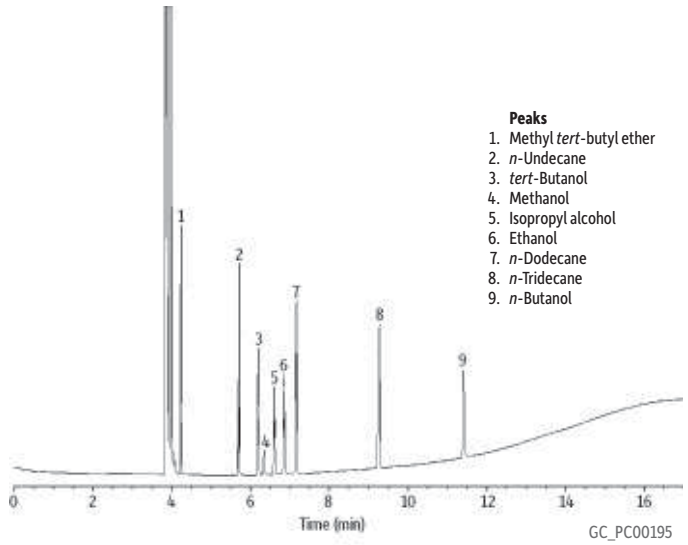
free literature

Analyzing Oxygenates in Gasoline Using TCEP and Rtx®-1/MXT®-1 Columns

Download your free copy from **www.restek.com**

lit. cat.# 59587A

Petroleum Oxygenates on Rt®-TCEP



Column	Rt®-TCEP, 60 m, 0.25 mm ID, 0.40 µm (cat.# 10999)
Sample	
Conc.:	500 ppm
Injection	
Inj. Vol.:	1.0 µL split
Inj. Temp.:	200 °C
Split Vent Flow Rate:	46 mL/min
Oven	
Oven Temp:	60 °C (hold 5 min) to 100 °C at 5 °C/min (hold 10 min)
Carrier Gas	He, constant pressure
Linear Velocity:	30 cm/sec @ 80 °C
Detector	FID @ 200 °C
Notes	FID sensitivity: 6.4 x 10^{-11} AFS

save money!

Get six columns for the price of five. **Call 800-356-1688, ext. 4**, or your Restek representative for details!

free literature

Biodiesel Solutions
Innovative Products for Simple, Reliable Biodiesel Analysis

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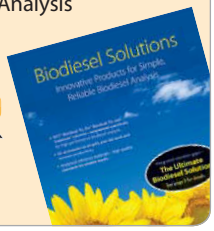
lit. cat.#
PCFL1409-UNV



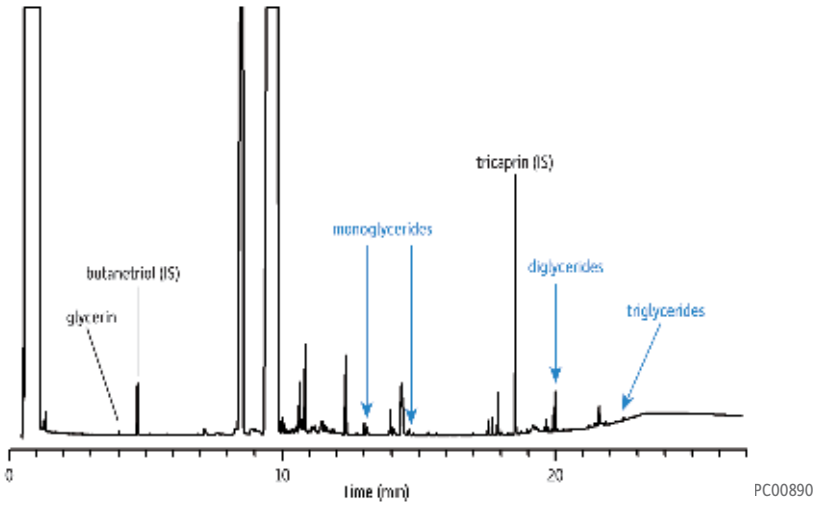
Biodiesel Fuels Analysis

Rtx®-Biodiesel TG Columns (fused silica)

- Linearity for all reference compounds exceeds method requirements.
- Columns with retention gaps feature Alumaseal® connectors to prevent leaks and extend column life.
- Low column bleed at high temperatures.
- For glycerin and glycerides analysis, according to ASTM D6584 and EN 14105 methods.

Description	temp. limits	cat.#
10 m, 0.32 mm ID, 0.10 µm	to 330/380 °C	10292
10 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm ID Retention Gap	to 330/380 °C	10291
15 m, 0.32 mm ID, 0.10 µm	to 330/380 °C	10294
15 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm ID Retention Gap	to 330/380 °C	10293

Glycerin in Biodiesel on Rtx®-Biodiesel TG



Column	Rtx®-Biodiesel TG, 10 m, 0.32 mm ID, 0.10 µm using Hydroguard® tubing 2 m, 0.53 mm ID, with Alumaseal® connector (cat.# 10291)
Sample	Biodiesel (B100) plus monoolein, diolein, triolein, glycerin, butanetriol, tricaprin
Injection	
Inj. Vol.:	1.0 µL cold on-column
Temp. Program:	oven track
Oven	
Oven Temp.:	50 °C (hold 1 min) to 180 °C at 15 °C/min (hold 7 min) to 230 °C at 30 °C/min to 380 °C at 30 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	4 mL/min
Detector	FID @ 380 °C

Detailed Hydrocarbon Analysis (DHA)

Rtx®-DHA Columns (fused silica)
(Crossbond® 100% dimethyl polysiloxane—optimized for hydrocarbon analysis)

- Columns meet or exceed all ASTM D6730-01 and CAN/CGSB 3.0 No. 14.3-99 method guidelines; test report for method D6730 supplied with each column.
- Excellent responses and peak symmetry for polar oxygenates.

Gasolines are complex mixtures of hundreds of compounds. Information about concentrations of the individual components is important for evaluating raw materials and for controlling refinery processes. ASTM D6730-01 outlines a high-resolution GC method for detailed hydrocarbon analysis (DHA) of gasolines. Rtx®-DHA columns are ideal for DHA methods and easily meet or exceed both ASTM D6730-01 and Canadian General Standards Board CAN/CGSB 3.0 No. 14.3-99 requirements. Every Rtx®-DHA column is tested for retention, efficiency, stationary phase selectivity, and bleed—guaranteeing reproducible column-to-column performance.

ID	df	temp. limits	50-Meter	100-Meter	150-Meter
0.20 mm	0.50 µm	-60 to 300/340 °C	10147		
0.25 mm	0.50 µm	-60 to 300/340 °C		10148	
	1.00 µm	-60 to 280/340 °C			10149

Rtx®-5 DHA Tuning Column (fused silica)
(Crossbond® 5% diphenyl/95% dimethyl polysiloxane—optimized for hydrocarbon analysis)

ID	df	temp. limits	5-Meter
0.25 mm	1.00 µm	-60 to 325/350 °C	10165

similar phases

HP-PONA, DB-Petro, CP-Sil PONA C8, Petrocol DH

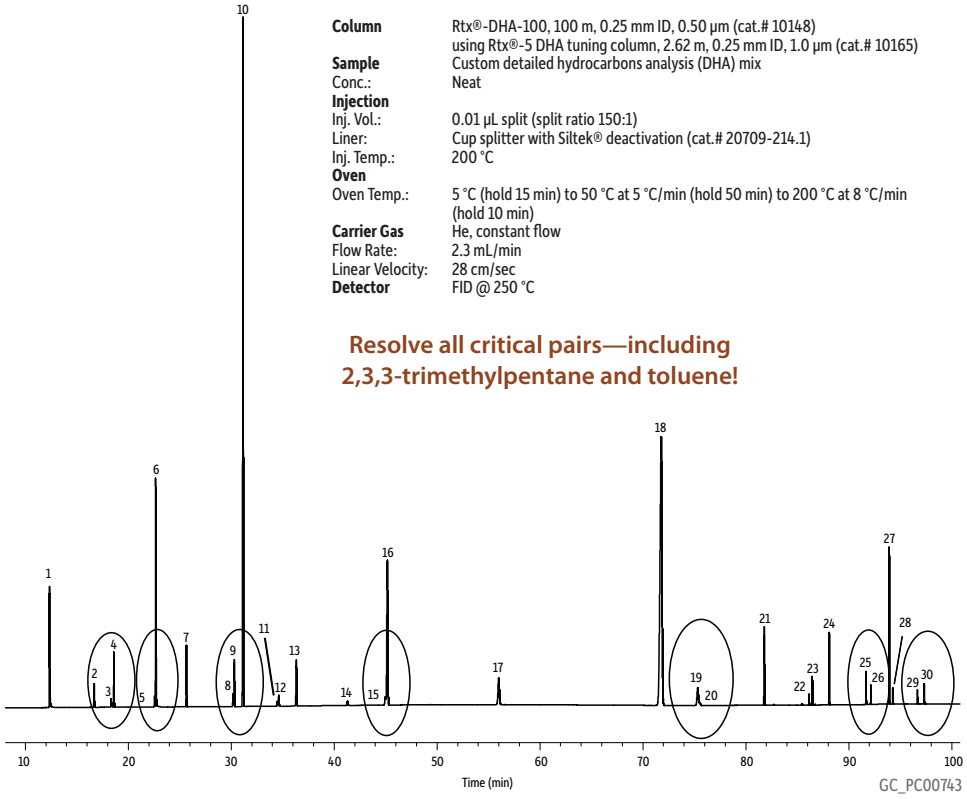
Method Recommended

ASTM Method	Column	cat. #	Dimensions
D6729	Rtx-DHA-100	10148	100 m x 0.25 mm, 0.50 µm
D6730	Rtx-DHA-100 & Rtx-5 DHA Tuning Column	10148 & 10165	100 m x 0.25 mm, 0.50 µm w/ precolumn
D6733	Rtx-DHA-50	10147	50 m x 0.20 mm, 0.50 µm
D5501	Rtx-DHA-150	10149	150 m x 0.25 mm, 1.0 µm

did you know?

Using hydrogen instead of helium can cut analysis time in half! Visit **www.restek.com** to learn more.

Detailed Hydrocarbons Analysis on Rtx®-DHA-100



Column Rtx®-DHA-100, 100 m, 0.25 mm ID, 0.50 µm (cat.# 10148) using Rtx®-5 DHA tuning column, 2.62 m, 0.25 mm ID, 1.0 µm (cat.# 10165)
Sample Custom detailed hydrocarbons analysis (DHA) mix
Conc.: Neat
Injection
Inj. Vol.: 0.01 µL split (split ratio 150:1)
Liner: Cup splitter with Siltek® deactivation (cat.# 20709-214.1)
Inj. Temp.: 200 °C
Oven
Oven Temp.: 5 °C (hold 15 min) to 50 °C at 5 °C/min (hold 50 min) to 200 °C at 8 °C/min (hold 10 min)
Carrier Gas He, constant flow
Flow Rate: 2.3 mL/min
Linear Velocity: 28 cm/sec
Detector FID @ 250 °C

Resolve all critical pairs—including 2,3,3-trimethylpentane and toluene!

Peaks
1. Ethanol
2. C5
3. *tert*-Butanol
4. 2-Methylbutene-2
5. 2,3-Dimethylbutane
6. Methyl *tert*-butyl ether (MTBE)
7. C6
8. 1-Methylcyclopentene
9. Benzene
10. Cyclohexane
11. 3-Ethylpentane
12. 1- *tert*-2-Dimethylcyclopentane
13. C7
14. 2,2,3-Trimethylpentane
15. 2,3,3-Trimethylpentane
16. Toluene
17. C8
18. Ethylbenzene
19. *p*-Xylene
20. 2,3-Dimethylheptane
21. C9
22. 5-Methylnonane
23. 1,2-Methylethylbenzene
24. C10
25. C11 (undecane)
26. 1,2,3,5-Tetramethylbenzene
27. Naphthalene
28. C12 (dodecane)
29. 1-Methylnaphthalene
30. C13 (tridecane)

Mineral Oils/Extractable Petroleum Hydrocarbon Analysis

similar phases
Select Mineral Oil

Fused Silica, PLOT, & MXT® Capillary GC Column Ferrule Guide

GC Column ID	Ferrule ID
0.10 mm	0.4
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.28 mm	0.4
0.32 mm	0.5
0.45 mm	0.8
0.53 mm	0.8

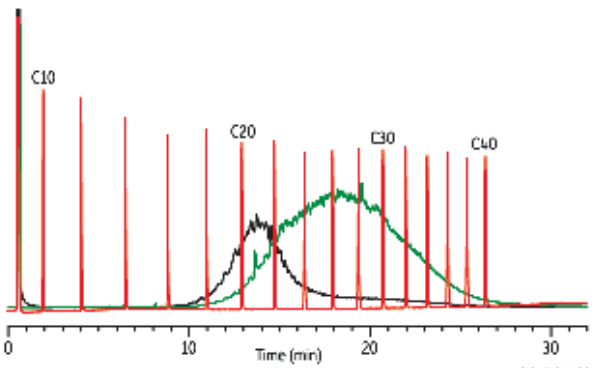
Rtx®-Mineral Oil Columns (fused silica)

- Application-specific columns meet DIN EN ISO 9377-2:2000 requirements.
- Optimized column dimensions for fast mineral oil screening.
- Surface-linked phase guarantees long lifetime, robustness, and stability to 400 °C.

The Rtx®-Mineral Oil stationary phase and column dimensions were optimized for the fast screening of mineral oils in extracts from solids and water samples according to DIN EN ISO 9377-2:2000. The 0.10 µm column is the gold standard for the method, whereas the 0.15 µm column provides more complete separation of C10 from the solvent peak when large injection volumes are used. Compared with common industry solutions, the unique surface bonding of the Rtx®-Mineral Oil column ensures long column lifetime, even at higher temperatures. These unique columns can be used at temperatures ranging from 380 °C (isothermal) to 400 °C (programmable), and each column is tested individually for bleed to ensure exceptional performance at these extreme conditions.

ID	df	temp. limits	15-Meter
0.32 mm	0.10 µm	-60 to 380/400 °C	18079
	0.15 µm	-60 to 380/400 °C	18074
	0.30 µm	-60 to 380/400 °C	18075

Mineral Oil and Motor Oil on Rtx®-Mineral Oil



GC_PC1169

Column	Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.15 µm (cat.# 18074) using IP deactivated guard column 2 m, 0.53 mm ID (cat.# 10047)
Sample	Custom mineral oil/motor oil mix
Diluent:	Hexane
Conc.:	500 µg/mL
Injection	
Inj. Vol.:	0.5 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	0.625 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC
Notes	Black trace = mineral oil Green trace = motor oil Red trace = C10-C40 standard

Simulated Distillation Analysis (C5-C44)

Rtx®-2887 Column (fused silica)
(nonpolar phase; Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

- Application-specific column for simulated distillation.
- Stable to 360 °C.

The Rtx®-2887 column's stationary phase, column dimensions, and film thickness have been optimized to exceed the resolution and skewing factor requirements specified in ASTM Method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention times. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, ensuring stable baselines and shorter conditioning times.

ID	df	temp. limits	10-Meter
0.53 mm	2.65 µm	-60 to 360 °C	10199

similar phases

DB-2887, Petrocol 2887, Petrocol EX2887

also available

Rtx®-1 SimDist 2887
A packed column for process instrumentation.

See **page 118.**

free literature

Rtx®-2887/MXT®-2887
Restek's Capillary GC Columns for Simulated Distillation of Petroleum Fractions

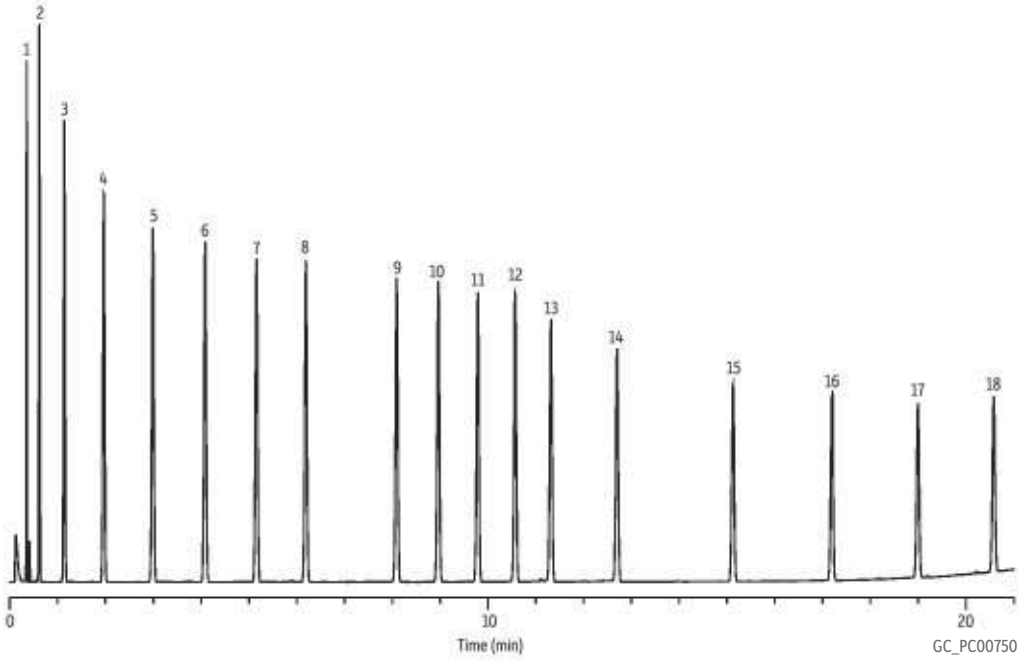
Download your free copy from **www.restek.com**

lit. cat.# 59567B

also available

For more simulated distillation products, **see pages 100–101**.

Simulated Distillation (C5-C44) on Rtx®-2887

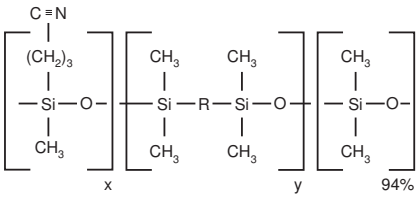


Peaks
1. C5
2. C6
3. C7
4. C8
5. C9
6. C10
7. C11
8. C12
9. C14
10. C16
11. C18
12. C20
13. C24
14. C28
15. C32
16. C36
17. C40
18. C44

Column	Rtx®-2887, 10 m, 0.53 mm ID, 2.65 µm (cat.# 10199)
Sample	C5 to C44 hydrocarbon standard
Diluent:	Carbon disulfide
Conc.:	0.01-0.1 wt. %
Injection	
Inj. Vol.:	1 µL direct
Inj. Temp.:	360 °C
Oven	
Oven Temp:	35 °C to 360 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	15 mL/min
Linear Velocity:	112 cm/sec
Detector	FID @ 360 °C

Organic Volatile Impurities (OVI) Analysis

Rxi®-624Sil MS Structure



Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar phases

DB-624, VF-624ms, CP-Select 624 CB, ZB-624

Rxi®-624Sil MS Columns (fused silica)

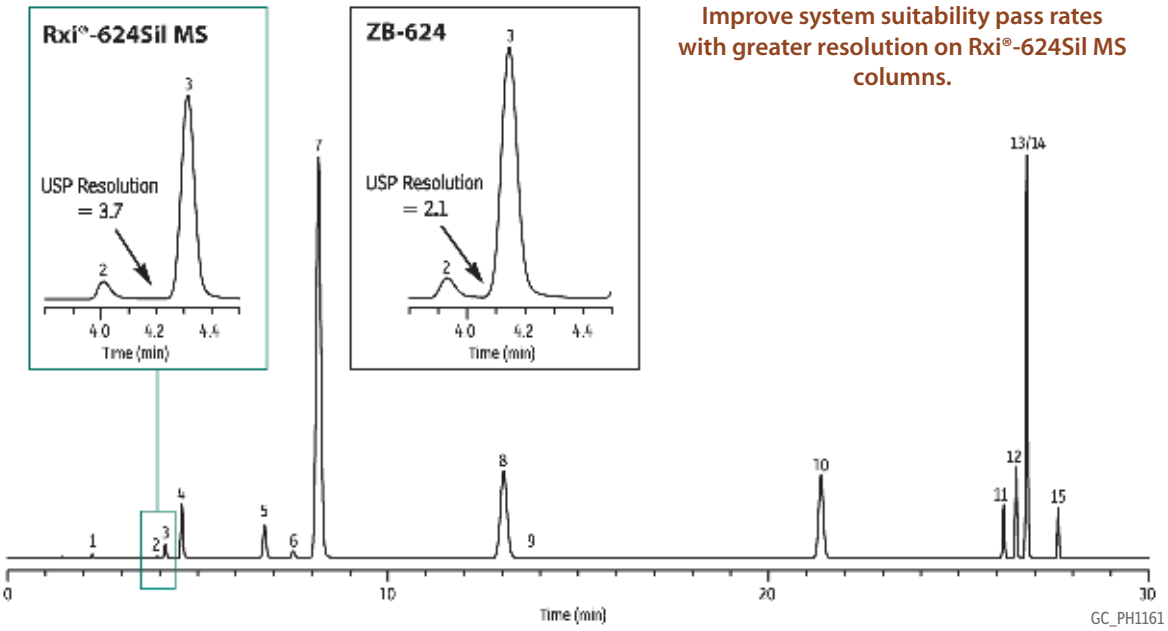
(midpolarity Crossbond® phase)

- Low-bleed, high-thermal stability column—maximum temperatures up to 320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.

ID	df	temp. limits	20-Meter	30-Meter	60-Meter	75-Meter	105-Meter
0.18 mm	1.00 µm	-20 to 300/320 °C	13865				
0.25 mm	1.40 µm	-20 to 300/320 °C		13868	13869		
0.32 mm	1.80 µm	-20 to 300/320 °C		13870	13872		
0.53 mm	3.00 µm	-20 to 280/300 °C		13871	13873	13874	13875

Competitor Comparison: Class 2 - Mix A Residual Solvents for USP <467> Water-Soluble Articles

Improve system suitability pass rates with greater resolution on Rxi®-624Sil MS columns.



Column	Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870)
Sample	Residual solvents class 2 - mix A (cat.# 36271)
Diluent:	Water
Injection	Headspace-loop split (split ratio 5:1)
Liner:	1 mm split (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	140 °C
Instrument:	Tekmar HT3
Inj. Time:	1 min
Transfer Line Temp.:	110 °C
Valve Oven Temp.:	110 °C
Sample Temp.:	80 °C
Sample Equil. Time:	60 min
Vial Pressure:	10 psi
Pressurize Time:	0.5 min
Pressure Equilibration Time:	0.05 min
Loop Pressure:	5 psi
Loop Fill Time:	0.1 min
Oven	
Oven Temp.:	40 °C (hold 20 min) to 240 °C at 10 °C/min (hold 20 min)
Carrier Gas	He, constant flow
Linear Velocity:	35 cm/sec
Dead Time:	1.45 min @ 40 °C
Detector	FID @ 250 °C
Data Rate:	5 Hz
Instrument	Agilent/HP6890 GC
Acknowledgement	**Teledyne Tekmar**

Peaks	tR (min)	Conc. (µg/mL)
1. Methanol	2.281	25.00
2. Acetonitrile	4.009	3.42
3. Dichloromethane	4.313	5.00
4. *trans*-1,2-Dichloroethene	4.798	7.83
5. *cis*-1,2-Dichloroethene	7.028	7.83
6. Tetrahydrofuran	7.706	5.75
7. Cyclohexane	8.708	32.33
8. Methylcyclohexane	14.099	9.83
9. 1,4-Dioxane	15.054	3.17
10. Toluene	22.018	7.42
11. Chlorobenzene	26.570	3.00
12. Ethylbenzene	26.837	3.07
13. *m*-Xylene	27.147	10.85
14. *p*-Xylene	27.147	2.53
15. *o*-Xylene	27.927	1.63

Organic Volatile Impurities (OVI) Analysis

Stabilwax® Columns (fused silica)
(polar phase; Crossbond® polyethylene glycol)

- Most stable polyethylene glycol (PEG) column available.
- Rugged enough to withstand repeated water injections.
- Lowest bleed PEG column on the market; long column lifetimes.
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

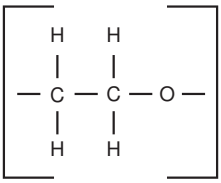
Restek's polar-deactivated surface tightly binds the Carbowax® polymer and increases thermal stability, relative to competitive columns. Because of the increased stability produced by the bonding process, Stabilwax® columns exhibit long column lifetimes, even when programming repeatedly up to 260 °C. The bonding mechanism of the column also produces polar compound retention times that do not shift as is often observed on other wax-type columns. In addition, this bonding mechanism produces a column that can be rejuvenated by solvent washing. Stabilwax® columns are used for a wide range of compounds and matrices including: FAMEs, flavor compounds, essential oils, solvents, aromatics including xylene isomers, acrolein/acrylonitrile (EPA 603), and oxygenated compounds. Also used for purity testing of chemicals and analyzing impurities in water matrices and alcoholic beverages.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	40 to 250/260 °C	10605	10608	10611
	0.25 µm	40 to 250/260 °C	10620	10623	10626
	0.50 µm	40 to 250/260 °C	10635	10638	10641
0.32 mm	0.25 µm	40 to 250/260 °C	10621	10624	10627
	0.50 µm	40 to 250/260 °C	10636	10639	10642
	1.00 µm	40 to 240/250 °C	10651	10654	10657
0.53 mm	0.25 µm	40 to 250/260 °C	10622	10625	10628
	0.50 µm	40 to 250/260 °C	10637	10640	10643
	1.00 µm	40 to 240/250 °C	10652	10655	10658
	1.50 µm	40 to 230/240 °C	10666	10669	10672
	2.00 µm	40 to 220/230 °C	10667	10670	

ID	df	temp. limits	10-Meter	20-Meter
0.15 mm	0.15 µm	40 to 250/260 °C	43830	43831
0.18 mm	0.18 µm	40 to 250 °C		40602

G16 phase

Stabilwax® Structure



similar phases

HP-INNOWax, CP Wax 52 CB, VF-WAX MS, ZB-WAXplus

ordering note

Get the protection without the connection!
For Stabilwax® columns with built-in Integra-Guard® guard columns, see **page 25**.

free literature

Residual Solvent Analysis

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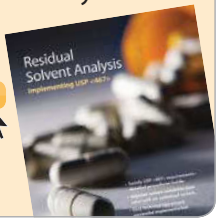
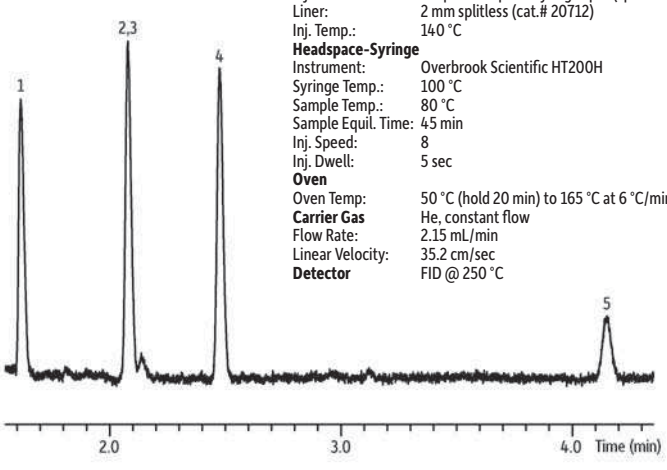
lit. cat.# PHFL1018A



Residual Solvents Class 1 on Stabilwax® (G16)



Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Residual solvents - class 1 (cat.# 36279) in 20 mL headspace vial (cat.# 24685)
Diluent:	Water
Injection	
Inj. Vol.:	1.0 µL headspace-syringe split (split ratio 5:1)
Liner:	2 mm splitless (cat.# 20712)
Inj. Temp.:	140 °C
Headspace-Syringe	
Instrument:	Overbrook Scientific HT200H
Syringe Temp.:	100 °C
Sample Temp.:	80 °C
Sample Equil. Time:	45 min
Inj. Speed:	8
Inj. Dwell:	5 sec
Oven	
Oven Temp:	50 °C (hold 20 min) to 165 °C at 6 °C/min (hold 20 min)
Carrier Gas	He, constant flow
Flow Rate:	2.15 mL/min
Linear Velocity:	35.2 cm/sec
Detector	FID @ 250 °C

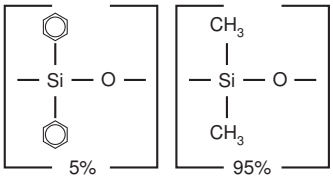
Peaks
1. 1,1-Dichloroethene
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Benzene
5. 1,2-Dichloroethane

SYSTEM SUITABILITY CRITERIA MET

GC_PH00951

G27 phase

Rtx®-5 Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar phases

HP-5, DB-5, CP-Sil 8 CB, ZB-5

Organic Volatile Impurities (OVI) Analysis

Rtx®-5 Columns (fused silica)
(low polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semivolatiles.
- Temperature range: -60 °C to 350 °C.
- Equivalent to USP G27 and G36 phases.

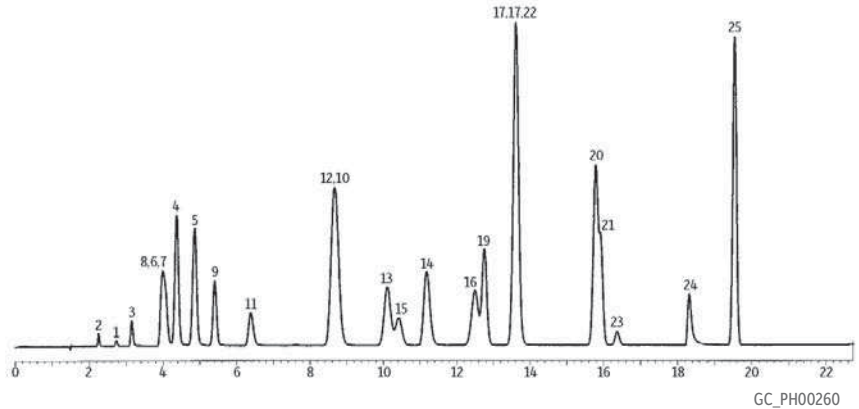
The diphenyl dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the Rtx®-5 polymer, providing a tight mono-modal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter	105-Meter
0.25 mm	0.10 µm	-60 to 330/350 °C	10205	10208	10211	
	0.25 µm	-60 to 330/350 °C	10220	10223	10226	10229
	0.50 µm	-60 to 330/350 °C	10235	10238	10241	10244
	1.00 µm	-60 to 325/340 °C	10250	10253	10256	10259
0.32 mm	0.10 µm	-60 to 330/350 °C	10206	10209	10212	
	0.25 µm	-60 to 330/350 °C	10221	10224	10227	
	0.50 µm	-60 to 330/350 °C	10236	10239	10242	
	1.00 µm	-60 to 325/340 °C	10251	10254	10257	10260
	1.50 µm	-60 to 310/330 °C	10266	10269	10272	10275
	3.00 µm	-60 to 280/300 °C	10281	10284	10287	10290
0.53 mm	0.10 µm	-60 to 320/340 °C	10207	10210		
	0.25 µm	-60 to 320/340 °C	10222	10225	10228	
	0.50 µm	-60 to 320/330 °C	10237	10240	10243	
	1.00 µm	-60 to 320/330 °C	10252	10255	10258	
	1.50 µm	-60 to 310/330 °C	10267	10270	10273	
	3.00 µm	-60 to 270/290 °C	10282	10285	10288	
	5.00 µm	-60 to 270/290 °C	10277	10279	10283	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.18 mm	0.20 µm	-60 to 325/340 °C	40201	40202	40203
	0.40 µm	-60 to 315/330 °C	40210	40211	40212

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Organic Volatile Impurities on Rtx®-5 (Rtx®-G27)



GC_PH00260

Peaks
1. Ethylene oxide
2. Methanol
3. Ethanol
4. Diethyl ether
5. 1,1-Dichloroethene
6. Acetone
7. Isopropanol
8. Acetonitrile
9. Methylene chloride
10. *n*-Hexane
11. *n*-Propanol
12. Methyl ethyl ketone
13. Ethyl acetate
14. Tetrahydrofuran
15. Chloroform
16. 1,1,1-Trichloroethane
17. Carbon tetrachloride
18. Benzene
19. 1,2-Dichloroethane
20. Heptane
21. Trichloroethylene
22. *n*-Butanol
23. 1,4-Dioxane
24. Pyridine
25. Toluene

Column Rtx®-5 w/5m Integra-Guard® Column (Rtx®-G27), 30 m, 0.53 mm ID, 5.00 µm (cat.# 10279-126)
Sample Headspace injection of common solvents for pharmaceutical processing. Prepared to equal about 500 ppm in the bulk pharmaceutical. Samples shaken and heated at 90 °C for 15 minutes, 1 mL headspace injection.

Injection
Inj. Vol.: 1,000 µL headspace-syringe split (split ratio 2:1)
Inj. Temp.: 220 °C
Oven
Oven Temp: 35 °C (hold 10 min) to 100 °C at 5 °C/min to 240 °C at 25 °C/min (hold 5 min)
Carrier Gas He, constant pressure
Linear Velocity: 35 cm/sec @ 35 °C
Detector FID @ 240 °C
Notes FID sensitivity: 1.05 x 10^{-11} AFS

Organic Volatile Impurities (OVI) Analysis

Rtx®-G27 Column (fused silica with 5-meter Integra-Guard® guard column)
(Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns for residual solvents in pharmaceutical products. Meet all requirements of USP <467>.
- Analytical column with Integra-Guard® guard column eliminates connecting problems and leaks.
- Rtx®-G27 stable to 290 °C.

Some USP <467> methods require the use of a guard column. Our Integra-Guard® integrated guard column system makes it easy to comply.

ID	df	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column
0.53 mm	5.00 µm	-60 to 270/290 °C	10279-126

Rtx®-G43 Column (fused silica with 5-meter Integra-Guard® guard column)
(Crossbond® cyanopropylphenyl dimethyl polysiloxane)

- Application-specific columns for residual solvents in pharmaceutical products. Meet all requirements of USP <467>.
- Analytical column with Integra-Guard® guard column eliminates connecting problems and leaks.
- Rtx®-G43 stable to 240 °C.

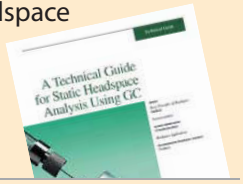
Some USP <467> methods require the use of a guard column. Our Integra-Guard® integrated guard column system makes it easy to comply.

ID	df	temp. limits	30-Meter with 5-Meter, 0.53mm ID Integra-Guard Guard Column
0.53 mm	3.00 µm	-20 to 240 °C	16085-126

USP
Pharmaceutical Standards
See **pages 551–552**.

free literature

A Technical Guide for Static Headspace Analysis Using GC



lit. cat.# 59895A

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lit. cat.# PHTS1212

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similar phases

HP-FFAP, DB-FFAP, VF-DA, CP WAX58, NUKOL, ZB-FFAP

crossbond® technology

Reduces bleed, prolongs column lifetime, and allows rejuvenation through solvent rinsing.

please note

Stabilwax®-DA columns should not be rinsed with water.

Acidic Compounds Analysis

Stabilwax®-DA Columns (fused silica)
(polar phase; Crossbond® acid-deactivated Carbowax® polyethylene glycol—for acidic compounds)

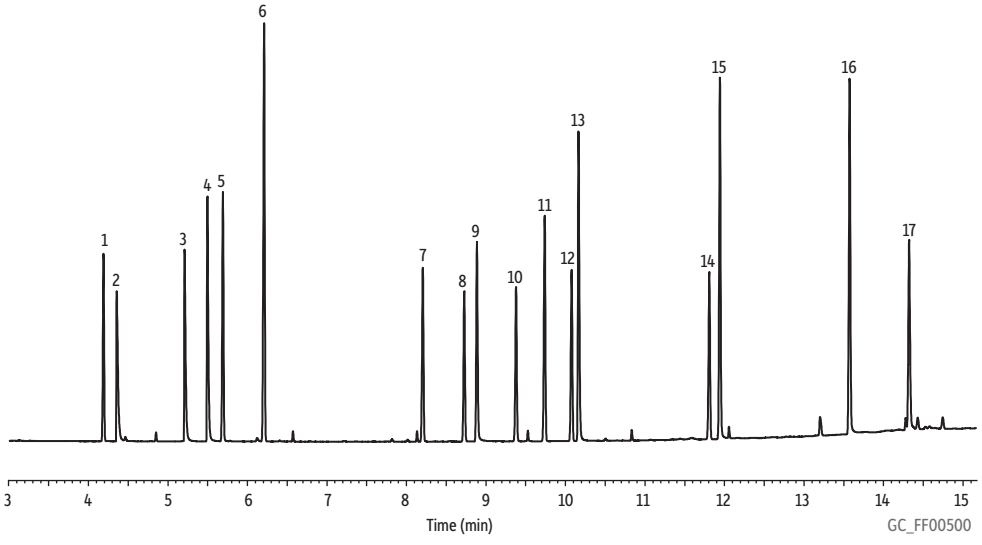
- Application-specific columns for free (underivatized) acids, some inorganic acids.
- Resistant to oxidative damage.
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G25, G35 phases.

Stabilwax®-DA bonded polyethylene glycol has an acidic functionality incorporated into the polymer structure. This permits analysis of acidic compounds without derivatization, significantly reduces adsorption of acids, and increases sample capacity for volatile free acids. Stabilwax®-DA columns last longer and give better peak shapes for high molecular weight acids.

Some inorganic acids also chromatograph well on a Stabilwax®-DA column; the limitation is the volatility of the acidic compound.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	40 to 250/260 °C	11005	11008	
	0.25 µm	40 to 250/260 °C	11020	11023	11026
	0.50 µm	40 to 250/260 °C	11035	11038	11041
0.32 mm	0.10 µm	40 to 250/260 °C		11009	
	0.25 µm	40 to 250/260 °C	11021	11024	11027
	0.50 µm	40 to 250/260 °C	11036	11039	11042
	1.00 µm	40 to 240/250 °C	11051	11054	11057
0.53 mm	0.10 µm	40 to 250/260 °C	11007		
	0.25 µm	40 to 250/260 °C	11022	11025	11028
	0.50 µm	40 to 250/260 °C	11037	11040	11043
	1.00 µm	40 to 240/250 °C	11052	11055	11058
	1.50 µm	40 to 230/240 °C	11062	11065	11068

Underivatized Alcoholic Beverage Acids and Methyl Esters on Stabilwax®-DA



Peaks	Conc. (µg/mL)
1. Ethyl octanoate	100
2. Acetic acid	100
3. Propionic acid	100
4. Isobutyric acid	100
5. 3-Decanol	50
6. Ethyl decanoate	50
7. Ethyl laurate	50
8. *cis*-Lactone	100
9. 2-Phenylethanol	50
10. *trans*-Lactone	100
11. Methyl myristate	50
12. Ethyl myristate	50
13. Octanoic acid	100
14. Ethyl palmitate	50
15. Decanoic acid	100
16. Dodecanoic acid	100
17. Vanillin	100

Column Stabilwax®-DA, 30 m, 0.18 mm ID, 0.18 µm (cat.# 550752)
Sample
Diluent: Ethyl acetate
Injection
Inj. Vol.: 1 µL splitless (hold 0.5 min)
Liner: Splitless (4 mm ID) w/glass wool (cat.# 20814-202.1)
Inj. Temp.: 240 °C
Oven
Oven Temp: 70 °C to 240 °C at 12 °C/min (hold 3 min)
Carrier Gas H_2, constant linear velocity
Linear Velocity: 28 psi, 193.1 kPa @ 240 °C
Detector FID
Make-up Gas Type: N_2

Basic Compounds Analysis

Rtx®-Volatile Amine Columns (fused silica)

- Unique selectivity for baseline resolution of all volatile amines.
- Excellent inertness assures accuracy and sensitivity for volatile amines, including free ammonia.
- Highly robust phase withstands repeated water injections, resulting in longer column lifetime.
- High temperature stability (290 °C) ensures elution of amines up to C16 and allows contaminants to be removed by "baking out" the column.

The Rtx®-Volatile Amine column was designed specifically for analyzing volatile amines in difficult matrices, such as water. The unique base deactivation creates an exceptionally inert surface for these sensitive compounds, resulting in highly symmetrical peaks that allow low detection limits. The stable bonded phase yields a column that is not only retentive and highly selective for these compounds, but it is also very robust and able to withstand repeated water injections. Comparisons made by customers performing routine volatile amine applications have shown the Rtx®-Volatile Amine column outperforms other amine-specific columns, especially for peak shape and lifetime. Each Rtx®-Volatile Amine column is held to stringent quality specifications and tested with a specially designed test mix that includes basic compounds to ensure exceptional inertness, reliability, and reproducibility. These qualities assure consistent performance and make the Rtx®-Volatile Amine column the best choice for volatile amines analysis.

ID	temp. limits	15-Meter	30-Meter	60-Meter
0.32 mm	-60 to 270/290 °C	18076	18077	18078

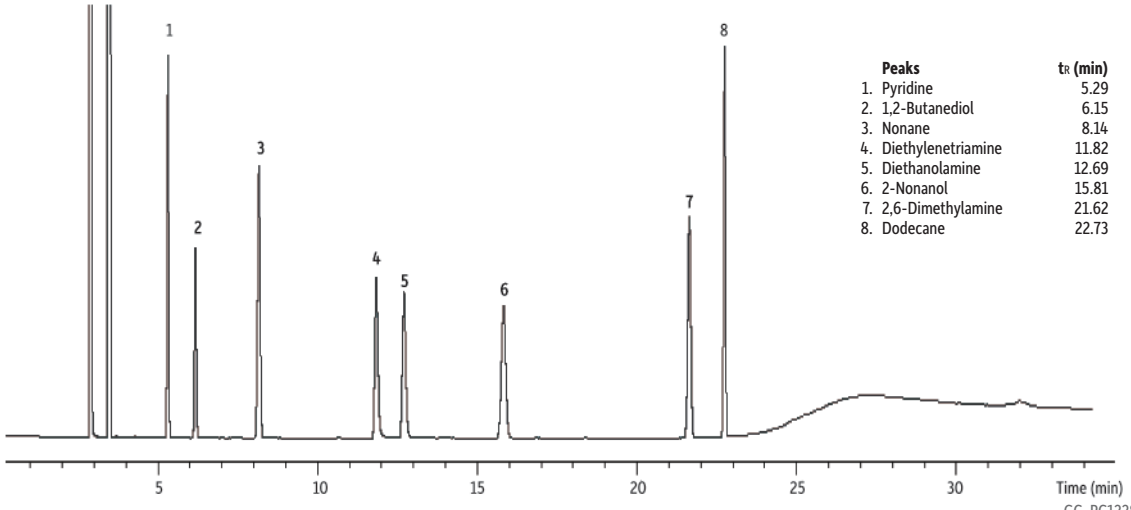
similar phase

CP-Volamine

please note

We recommend using base-deactivated fused silica guard columns **(page 24)** and base-deactivated liners (**page 185**) with Rtx®-Volatile Amine columns.

Volatile Amine Test Mix on Rtx®-Volatile Amine (60 m x 0.32 mm ID)



GC_PC1228

Peaks	t_R (min)
1. Pyridine	5.29
2. 1,2-Butanediol	6.15
3. Nonane	8.14
4. Diethylenetriamine	11.82
5. Diethanolamine	12.69
6. 2-Nonanol	15.81
7. 2,6-Dimethylamine	21.62
8. Dodecane	22.73

Column	Rtx®-Volatile Amine, 60 m, 0.32 mm ID (cat.# 18078)
Sample	Volatile amine column test mix (cat.# 35008)
Diluent:	Methanol:dichloromethane (50:50)
Conc.:	900-1,800 µg/mL snap and shoot
Injection	
Inj. Vol.:	1 µL split (split ratio 17.8:1)
Liner:	Sky® 4 mm single taper w/wool (cat.# 23303.1)
Inj. Temp.:	250 °C
Split Vent Flow Rate:	60 mL/min
Oven	
Oven Temp.:	160 °C (hold 21 min) to 290 °C at 40 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Flow Rate:	3.4 mL/min
Detector	FID @ 300 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	50 Hz
Instrument	Agilent/HP6890 GC

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similar phases
PTA-5, CP-Sil CB

please note
We recommend using base-deactivated fused silica guard columns **(page 24)** and base-deactivated liners (**page 185**) with Rtx®-5 Amine columns.

Basic Compounds Analysis

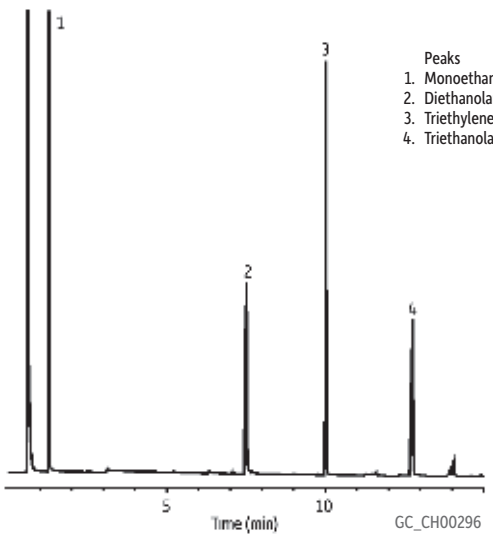
Rtx®-5 Amine Columns (fused silica)
(low polarity phase; Crossbond® 5% diphenyl/95% dimethyl polysiloxane)

- Application-specific columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Stable to 315 °C.

Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-5 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-5 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds, adsorptive compounds with oxygen groups susceptible to hydrogen bonding, or even weakly acidic compounds such as phenols. Every Rtx®-5 Amine column is tested to ensure that it exceeds the requirements for analyzing ppm levels of amines, without priming, and to ensure low bleed at maximum operating temperature.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.25 µm	-60 to 315 °C	12320	12323
	0.50 µm	-60 to 300/315 °C	12335	12338
	1.00 µm	-60 to 300/315 °C	12350	12353
0.32 mm	1.00 µm	-60 to 300/315 °C	12351	12354
	1.50 µm	-60 to 290/305 °C	12366	12369
0.53 mm	1.00 µm	-60 to 290/305 °C	12352	12355
	3.00 µm	-60 to 280/295 °C	12382	12385

Ethanolamines on Rtx®-5 Amine



Column	Rtx®-5 Amine, 15 m, 0.25 mm ID, 0.50 µm (cat.# 12335)
Sample	Ethanolamine mix
Diluent:	Methanol
Conc.:	34 ng on column
Injection	
Inj. Vol.:	1.0 µL split (split ratio 58:1)
Inj. Temp.:	280 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 180 °C at 10 °C/min (hold 2 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	43 cm/sec @ 50 °C
Detector	FID @ 300 °C
Notes	FID sensitivity: 6.4 x 10^{-11} AFS

Basic Compounds Analysis

Rtx®-35 Amine Columns (fused silica)
(midpolarity phase; Crossbond® 35% diphenyl/65% dimethyl polysiloxane)

- Application-specific columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Stable to 220 °C.

Active basic compounds that otherwise require derivatization, or an alternative analytical technique, can be analyzed on an Rtx®-35 Amine column. The tubing surface is chemically altered to reduce tailing of basic compounds, eliminating the need for column priming. An Rtx®-35 Amine column is ideal for analyzing a wide variety of basic compounds, but breakthrough technology also allows the analysis of neutral compounds and adsorptive compounds with oxygen groups susceptible to hydrogen bonding. Every Rtx®-35 Amine column is tested to ensure that it meets the requirements for analyzing ppm levels of amines, without priming, and to ensure low bleed at maximum operating temperature.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.50 µm	0 to 220 °C	11335	11338
	1.00 µm	0 to 220 °C	11350	11353
0.32 mm	1.00 µm	0 to 220 °C	11351	11354
	1.50 µm	0 to 220 °C	11366	11369
0.53 mm	1.00 µm	0 to 220 °C	11352	11355
	3.00 µm	0 to 220 °C		11385

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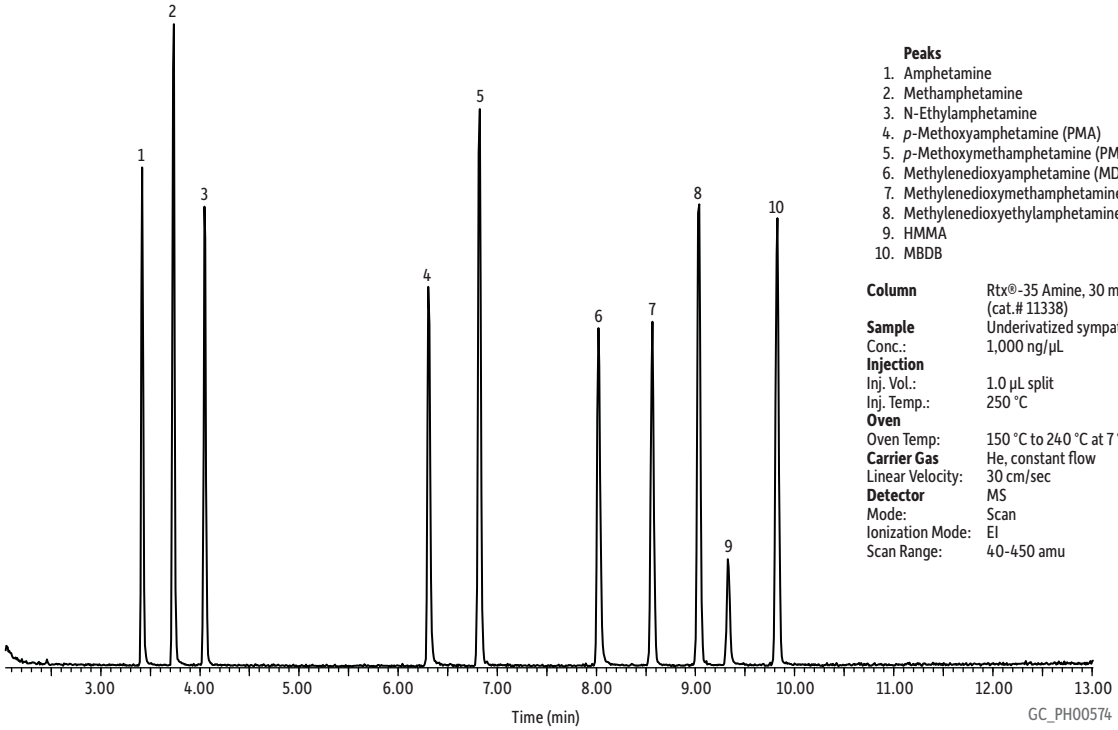
please note

We recommend using base-deactivated fused silica guard columns **(page 24)** and base-deactivated liners (**page 185**) with Rtx®-35 Amine columns.

Table of Contents for
GC Chromatograms
See **page 570.**

Underivatized Sympathomimetic Amines (Basic Drugs) on Rtx®-35 Amine



Peaks
1. Amphetamine
2. Methamphetamine
3. N-Ethylamphetamine
4. *p*-Methoxyamphetamine (PMA)
5. *p*-Methoxymethamphetamine (PMMA)
6. Methylenedioxyamphetamine (MDA)
7. Methylenedioxymethamphetamine (MDMA)
8. Methylenedioxyethylamphetamine (MDEA)
9. HMMA
10. MBDB

Column	Rtx®-35 Amine, 30 m, 0.25 mm ID, 0.50 µm (cat.# 11338)
Sample	Underivatized sympathomimetic amines
Conc.:	1,000 ng/µL
Injection	
Inj. Vol.:	1.0 µL split
Inj. Temp.:	250 °C
Oven	
Oven Temp:	150 °C to 240 °C at 7 °C/min
Carrier Gas	He, constant flow
Linear Velocity:	30 cm/sec
Detector	MS
Mode:	Scan
Ionization Mode:	EI
Scan Range:	40-450 amu

similar phases

CAM, CP WAX 51, Carbowax® Amine

free literature

GC Analysis of Non-Purgeable Solvents in Pharmaceutical Discharges

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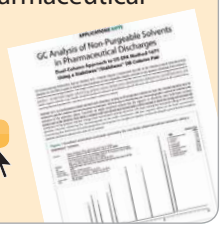
lit. cat.# 580027



Basic Compounds Analysis

Stabilwax®-DB Columns (fused silica)
(polar phase; Crossbond® base-deactivated Carbowax® polyethylene glycol—for amines and basic compounds)

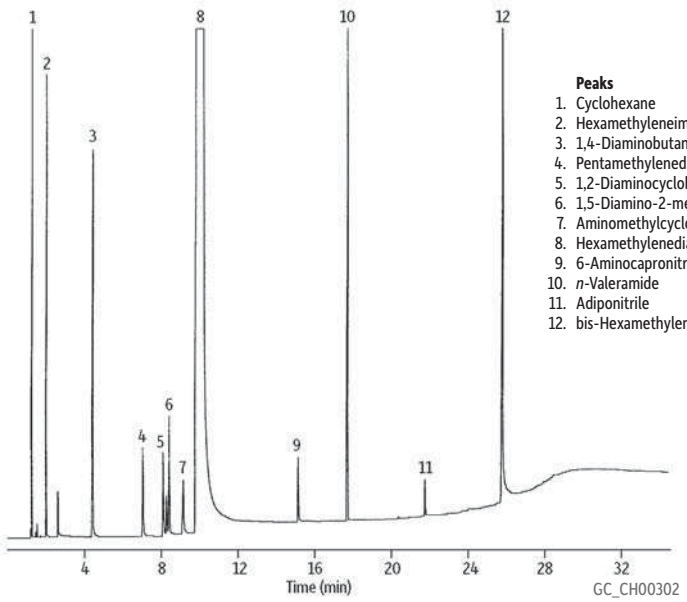
- Application-specific columns for underivatized amines and other basic compounds, including alkylamines, diamines, triamines, nitrogen-containing heterocyclics. No need for column priming.
- Temperature range: 40 °C to 220 °C.

Stabilwax®-DB columns reduce adsorption and improve responses for many basic compounds, without analyte derivatization or column priming. For different selectivity of basic compounds, or higher oven temperatures, use an Rtx®-5 Amine column.

Stabilwax®-DB is a bonded stationary phase, but avoid rinsing these columns with water or alcohols.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	40 to 210/220 °C	10820	10823	
	0.50 µm	40 to 210/220 °C		10838	
0.32 mm	0.25 µm	40 to 210/220 °C	10821	10824	
	0.50 µm	40 to 210/220 °C		10839	
	1.00 µm	40 to 210/220 °C	10851	10854	10857
0.53 mm	0.50 µm	40 to 210/220 °C		10840	
	1.00 µm	40 to 210/220 °C	10852	10855	10858
	1.50 µm	40 to 210/220 °C		10869	

Hexamethylenediamine on Stabilwax®-DB



Peaks
1. Cyclohexane
2. Hexamethyleneimine
3. 1,4-Diaminobutane
4. Pentamethylenediamine
5. 1,2-Diaminocyclohexane
6. 1,5-Diamino-2-methylpentane
7. Aminomethylcyclopentylamine
8. Hexamethylenediamine
9. 6-Aminocapronitrile
10. *n*-Valeramide
11. Adiponitrile
12. bis-Hexamethylenetriamine

Column	Stabilwax®-DB, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10824)
Sample	Neat hexamethylenediamine (HMD)
Conc.:	10 to 1,000 ng/component on-column
Injection	
Inj. Vol.:	0.4 µL direct
Inj. Temp.:	250 °C
Oven	
Oven Temp:	95 °C (hold 6 min) to 235 °C at 7 °C/min (hold 4 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	40 cm/sec
Detector	FID @ 250 °C
Notes	FID sensitivity: 2 x 10^{-11} AFS

Chiral Analysis

Cyclodextrin Columns for Analyzing Many Chiral Compounds

By adding β or γ cyclodextrin to our bonded Rtx®-1701 stationary phase, we greatly enhance overall utility and column lifetime for our chiral columns, compared to columns that have pure cyclodextrin stationary phases. Separations of more than one hundred chiral compounds have been achieved using our unique DEX columns, and our columns continue to demonstrate stability after hundreds of temperature program cycles.

Rt®-γDEXsa Columns (fused silica)

(2,3-di-acetoxy-6-O-*tert*-butyl dimethylsilyl gamma cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Larger organic molecules. Also useful for flavor compounds in fruit juices.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	40 to 230 °C	13113
0.32 mm	0.25 µm	40 to 230 °C	13112

Rt®-βDEXm Columns (fused silica)

(permethylated beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: General-purpose chiral phase with many published applications.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	40 to 230 °C	13100
0.32 mm	0.25 µm	40 to 230 °C	13101

Rt®-βDEXsm Columns (fused silica)

(2,3-di-O-methyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Excellent column for most chiral compounds in essential oils.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	40 to 230 °C	13105
0.32 mm	0.25 µm	40 to 230 °C	13104

Rt®-βDEXse Columns (fused silica)

(2,3-di-O-ethyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Similar in performance to Rt-βDEXsm, but provides better resolution for limonene, linalool, linalyl acetate, ethyl-2-methylbutyrate, 2,3-butane diol, and styrene oxides.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	40 to 230 °C	13107
0.32 mm	0.25 µm	40 to 230 °C	13106

Rt®-βDEXsp Columns (fused silica)

(2,3-di-O-propyl-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Often useful in dual-column configurations with the Rt-βDEXsm column for complex enantiomeric separations.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	40 to 230 °C	13111
0.32 mm	0.25 µm	40 to 230 °C	13110

Rt®-βDEXsa Columns (fused silica)

(2,3-di-acetoxy-6-O-*tert*-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Unique selectivity for esters, lactones, and other fruit flavor components.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	40 to 230 °C	13109
0.32 mm	0.25 µm	40 to 230 °C	13108

Rt®-βDEXcst Columns (fused silica)

(Proprietary cyclodextrin material added into 14% cyanopropylphenyl/86% dimethyl polysiloxane)

Uses: Proprietary stationary phase, developed specifically for the fragrance industry. Also used for pharmaceutical applications.

ID	df	temp. limits	30-Meter
0.25 mm	0.25 µm	40 to 230 °C	13103
0.32 mm	0.25 µm	40 to 230 °C	13102

please note

Application-specific chiral column kits are available! See **www.restek.com**

tech tip

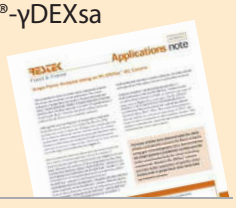
Chiral selectivity improves significantly by realizing lower elution temperatures.
This can be achieved by:

- Faster linear velocities (80 cm/sec) with hydrogen carrier gas.
- Slower temperature ramp rates (1–2 °C/min).
- Appropriate minimum operating temperature (40 or 60 °C).
- On-column concentrations of 50 ng or less.

free literature

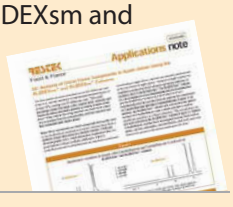
Grape Flavor Analysis, Using an Rt®-γDEXsa GC Column

lit. cat.# 59553



GC Analysis of Chiral Flavor Compounds in Apple Juices, Using Rt®-βDEXsm and Rt®-βDEXse Columns

lit. cat.# 59546



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GC Columns

Metal MXT® Capillary Columns

MXT® Columns Overview

What is an MXT® column?

MXT® columns are wall coated open tubular (WCOT) columns made from stainless steel tubing that has had the internal surface treated with our exclusive Siltek® surface treatment. The Siltek® layer makes the surface as inert as deactivated fused silica. The unique Siltek® process enables us to offer MXT® columns in a wide range of internal diameters, including 0.18 mm, 0.25 mm, 0.28 mm, 0.32 mm, and 0.53 mm. Because the Siltek® layer permeates the stainless steel surface, rather than simply coating it, the layer is exceptionally flexible, so the tubing can be coiled to very small diameters. **The standard coil diameter for MXT® columns is 4.5 inches**. The minimum coil diameter for 0.53 mm ID columns is 2.5 inches, and the minimum coil diameter for 0.25 mm ID columns is 1.5 inches.

4.5" coil,
standard diameter

The unique properties of the Siltek®-treated surface enable us to treat the tubing with a wide variety of polymer phases. The many choices of MXT® columns include:

- MXT®-1
- MXT®-5
- MXT®-20
- MXT®-35
- MXT®-50
- MXT®-65
- MXT®-1301
- MXT®-1701
- MXT®-200
- MXT®-WAX
- MXT®-65TG
- MXT®-Biodiesel TG
- MXT®-2887
- MXT®-1HT SimDist
- MXT®-1 SimDist
- MXT®-500 SimDist
- MXT®-502.2
- MXT®-Volatiles
- MXT®-624
- Guard tubing

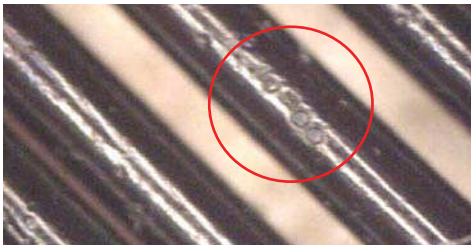
MXT
ideal for high-temperature analyses

Compare MXT® columns and fused silica columns:

- Metal tubing allows MXT® columns to be used to higher temperatures (430 °C) than fused silica columns (standard rating is 360 °C). This is because the polyimide resin that encases the fused silica becomes brittle over time at high temperatures. MXT® columns do not become brittle.
- Inertness of MXT® columns and fused silica columns is similar, due to the unique properties of the Siltek® surface treatment in MXT® columns.
- Metal columns can be coiled under 4.5 inches without breaking, ideal for small instruments.
- Coating efficiency (plates/meter) of MXT® columns is similar to that of fused silica.
- MXT® columns will not break under stress.

MXT®-Biodiesel TG columns are undamaged by high thermal cycles compared to high-temperature fused silica columns, which break down under the same conditions.

MXT®-Biodiesel TG columns are undamaged by high thermal cycles.



HT fused silica columns, labeled as stable to 430 °C, show pitting and breakdown.

100 temperature cycles to 430 °C totaling 500 minutes at maximum temperature.

MXT® columns are your best choice for:

- Situations in which the potential for column breakage is high:
  - Field instruments
  - Process GC
  - GCs with small ovens, such as portable instruments, requiring tightly coiled columns.
- High temperature chromatography. Siltek®-deactivated stainless steel tubing can withstand temperatures exceeding 430 °C; the only limitation to oven temperature is the polymer itself.

Custom MXT® columns

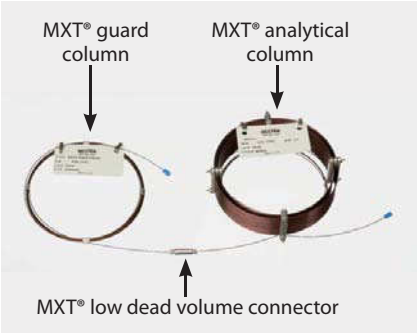
We are able to supply 0.18, 0.25, 0.28, 0.32, and 0.53 mm ID columns with the phases listed above in many different configurations. If you do not see the column you need listed in the following pages, contact Customer Service and we will be happy to help.

also available
Metal PLOT columns
See **page 113.**

Guard/Retention Gap Columns, Tubing Scorer

MXT® guard columns are tested for inertness and bleed.

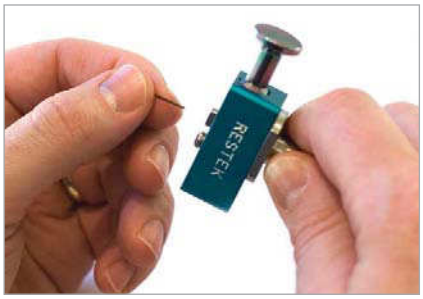
Connect MXT® columns using an MXT® Low Dead Volume Connector!



also available

Column connector kits & ferrules

See **page 213.**



Make a perfect column cut every time!

Intermediate-Polarity Deactivated MXT® Guard/Retention Gap Columns/ Transfer Lines (passivated stainless steel)

- Useful for a wide range of applications.
- Compatible with most common solvents.
- Maximum temperature: 325 °C

Nominal ID	Nominal OD	5-Meter	5-Meter/6-pk.	10-Meter
0.28 mm	0.56 ± 0.025 mm	70044	70044-600	70046
0.53 mm	0.74 ± 0.025 mm	70045	70045-600	70047

Hydroguard®-Treated MXT® Guard/Retention Gap Columns/Transfer Lines (passivated stainless steel)

- Extend analytical column lifetime by preventing degradation from harsh "steam-cleaning" water injections.
- Maximum temperature: 325 °C.

When transfer lines from purge-and-trap systems, air monitoring equipment, or other instruments carry condensed water vapor, deactivated column tubing quickly becomes active because of the creation of free silanol groups. These silanol groups adsorb active oxygenated compounds, such as alcohols and diols.

Restek chemists have addressed this concern and found a solution—Hydroguard® deactivated tubing. A unique deactivation chemistry creates a high-density surface that is not readily attacked by aggressive hydrolysis. The high-density surface coverage of the Hydroguard® deactivation layer effectively prevents water vapor from reaching the surface beneath. Use Hydroguard® tubing for connecting GCs to:

- Headspace analyzers.
- Air analysis equipment and concentrator units.
- Purge-and-trap systems.

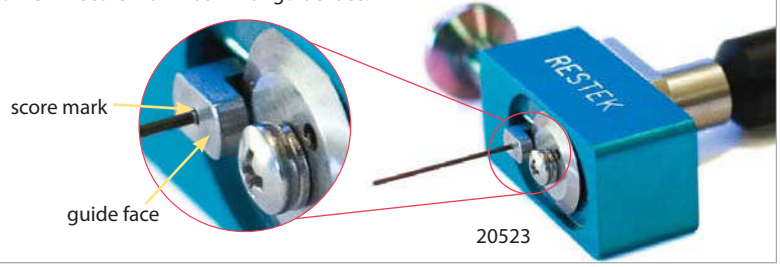
Nominal ID	Nominal OD	5-Meter	10-Meter	30-Meter*	60-Meter*†
0.28 mm	0.56 ± 0.025 mm	70080	70083	70086	70089
0.53 mm	0.74 ± 0.025 mm	70081	70084	70087	70090

*30- and 60-meter lengths are banded in 5-meter sections.

†Recommendation: Cut 60 m guard columns into shorter lengths. Using full length may cause peak distortion.

Diameters greater than 0.10 mm are tested with the Grob test mix to ensure high inertness.

Enlarged view—score mark flush with guide face.



Restek Tubing Scorer for MXT® Columns

- Makes a perfect cut every time.
- Easy to use.
- Leaves column entrance perfectly round.
- Ideal for creating a leak-free seal with connectors and valves.

Metal MXT® columns are easy to cut. Scoring wafers can be used, but may leave the column end irregularly shaped. The Restek tubing scorer is designed to make a perfect cut every time, leaving the column entrance perfectly round.

Description	qty.	cat.#
Restek Tubing Scorer for MXT Columns (0.25-0.53 mm ID & 0.5-0.8 mm OD)	ea.	20523
Replacement Scoring Wheel	ea.	20522

MXT®-1 Columns (Siltek®-treated stainless steel)

(nonpolar phase; Crossbond® dimethyl polysiloxane)

- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, and oxygenates.
- Temperature range: -60 °C to 430 °C.
- Equivalent to USP G1, G2, G38 phases.

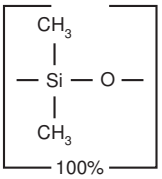
MXT®-1 columns exhibit long lifetime and very low bleed at high operating temperatures. A proprietary synthesis process eliminates residual catalysts that could cause degradation and increase bleed.

ID	df	temp. limits	6-Meter	15-Meter	30-Meter	60-Meter	105-Meter
0.25 mm	0.10 µm	-60 to 360/430 °C		70105	70116	70117	70114
	0.25 µm	-60 to 360/430 °C		70120	70123	70126	70129
	0.50 µm	-60 to 330/400 °C		70135	70138	70141	70144
	1.00 µm	-60 to 320/360 °C		70150	70153	70156	70159
0.28 mm	0.10 µm	-60 to 360/430 °C	70102	70106	70109		
	0.25 µm	-60 to 360/430 °C		70121	70124	70127	
	0.50 µm	-60 to 330/400 °C		70136	70139	70142	
	1.00 µm	-60 to 320/360 °C		70151	70154	70157	
	3.00 µm	-60 to 285/360 °C		70181	70184	70187	
0.53 mm	0.15 µm	-60 to 360/430 °C	70101	70107			
	0.25 µm	-60 to 360/430 °C		70122	70125	70128	
	0.50 µm	-60 to 330/400 °C		70137	70140	70143	
	1.00 µm	-60 to 320/360 °C		70152	70155	70158	
	1.50 µm	-60 to 310/360 °C		70167	70170	70173	
	3.00 µm	-60 to 285/360 °C		70182	70185	70188	70189
	5.00 µm	-60 to 270/360 °C		70177	70179	70183	
	7.00 µm	-60 to 240/360 °C		70191	70192	70193	

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.18 mm	0.20 µm	-60 to 330/430 °C	71811	71812	71813
	0.40 µm	-60 to 320/400 °C	71814	71815	71816

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-1 Structure



Similar to: (100%-methyl)-polysiloxane

similar columns

DB-PS1, UAC-1, UAC-1MS

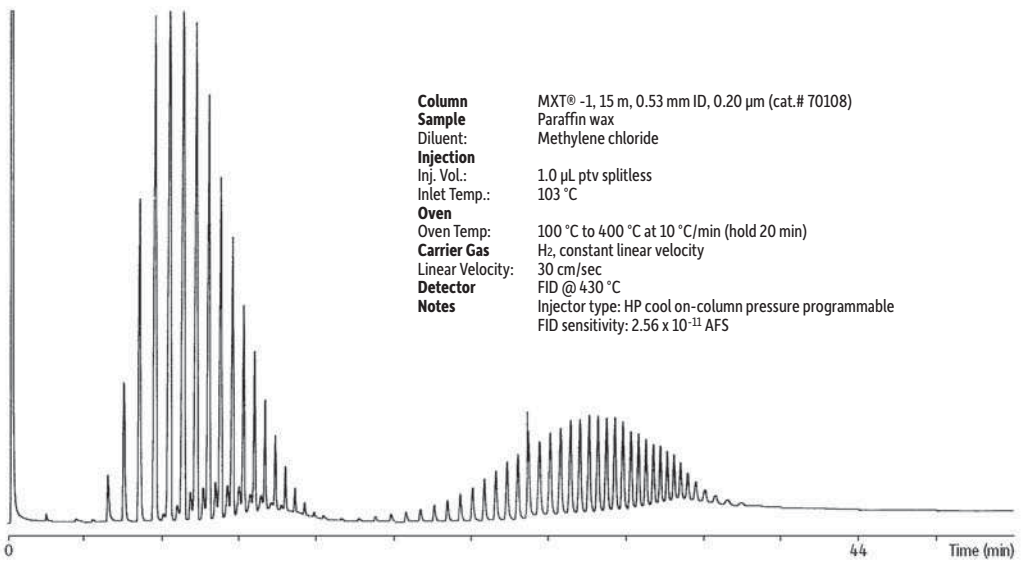
free literature

Analyzing Oxygenates in Gasoline Using TCEP and Rtx®-1/MXT®-1 Columns

Download your free copy from www.restek.com

lit. cat.# 59587A

Hydrocarbons (High Temp. Petroleum Wax) on MXT®-1

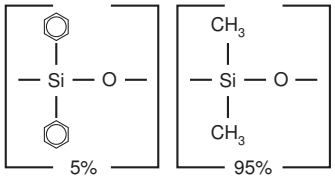


GC_PC00223

Column	MXT® -1, 15 m, 0.53 mm ID, 0.20 µm (cat.# 70108)
Sample	Paraffin wax
Diluent:	Methylene chloride
Injection	
Inj. Vol.:	1.0 µL ptv splitless
Inlet Temp.:	103 °C
Oven	
Oven Temp:	100 °C to 400 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant linear velocity
Linear Velocity:	30 cm/sec
Detector	FID @ 430 °C
Notes	Injector type: HP cool on-column pressure programmable
	FID sensitivity: 2.56 x 10^{-11} AFS

General-Purpose Columns

MXT®-5 Structure



Similar to: (5%-phenyl)-methylpolysiloxane

similar columns

DB-PS5, VF-5ht UltiMetal, UAC-5, UAC-5MS

also available

Metal MXT® PLOT Columns

See **page 113.**

MXT®-5 Columns (Siltek®-treated stainless steel)

(low polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, and semivolatiles.
- Temperature range: -60 °C to 430 °C.
- Equivalent to USP G27, G36 phases.

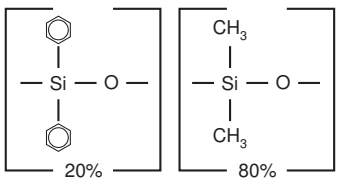
The diphenyl dimethyl polysiloxane stationary phase is the most popular GC stationary phase and is used in a wide variety of applications. All residual catalysts and low molecular weight fragments are removed from the MXT®-5 polymer, providing a tight monomodal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	-60 to 330/430 °C	70205	70208	70211
	0.25 µm	-60 to 360/430 °C	70220	70223	70226
	0.50 µm	-60 to 330/360 °C	70235	70238	70241
	1.00 µm	-60 to 310/340 °C	70250	70253	70256
0.28 mm	0.25 µm	-60 to 340/430 °C	70221	70224	70227
	0.50 µm	-60 to 315/400 °C	70236	70239	70242
	1.00 µm	-60 to 310/360 °C	70251	70254	70257
	3.00 µm	-60 to 290/360 °C	70281	70284	70287
0.53 mm	0.25 µm	-60 to 340/430 °C	70222	70225	70228
	0.50 µm	-60 to 330/400 °C	70237	70240	70243
	1.00 µm	-60 to 310/360 °C	70252	70255	70258
	1.50 µm	-60 to 300/360 °C	70267	70270	70273
	3.00 µm	-60 to 290/360 °C	70282	70285	70288
	5.00 µm	-60 to 270/360 °C	70277	70279	70283

ID	df	temp. limits	10-Meter	20-Meter	40-Meter
0.18 mm	0.20 µm	-60 to 325/430 °C	71821	71822	71823
	0.40 µm	-60 to 315/400 °C	71824	71825	71826

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-20 Structure



Similar to: (20%-phenyl)-methylpolysiloxane

MXT®-20 Columns (Siltek®-treated stainless steel)

(low to midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for volatile compounds, flavor compounds, and alcoholic beverages.
- Temperature range: -20 °C to 340 °C.
- Equivalent to USP G28, G32 phases.

MXT®-20 polymer is synthesized to exacting standards. All residual catalysts and low molecular weight fragments are removed from the polymer, providing a tight monomodal distribution and extremely low bleed.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	-20 to 300/340 °C	70320	70323	70326
	1.00 µm	-20 to 300/340 °C	70350	70353	70356
0.28 mm	0.25 µm	-20 to 310/340 °C	70321	70324	70327
	1.00 µm	-20 to 295/340 °C	70351	70354	70357
	3.00 µm	-20 to 260/340 °C	70381	70384	70387
0.53 mm	0.25 µm	-20 to 300/340 °C	70322	70325	70328
	1.00 µm	-20 to 260/340 °C	70352	70355	70358
	3.00 µm	-20 to 260/340 °C	70382	70385	70388

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-35 Columns (Siltek®-treated stainless steel)

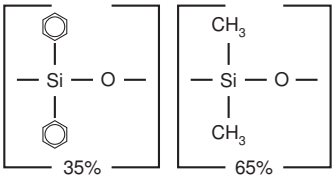
(midpolarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for organochlorine pesticides, PCB congeners (e.g. Aroclor mixes), herbicides, pharmaceuticals, sterols, rosin acids, and phthalate esters.
- Temperature range: 0 °C to 340 °C.
- Equivalent to USP G42 phase.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.50 µm	0 to 290/340 °C	70435	70438	
	1.00 µm	0 to 290/340 °C	70450	70453	
0.53 mm	1.00 µm	0 to 260/340 °C	70452	70455	70458
	1.50 µm	0 to 250/340 °C	70467	70470	70473
	3.00 µm	0 to 240/340 °C	70482	70485	70488

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-35 Structure



Similar to: (35%-phenyl)-methylpolysiloxane

similar column

DB-PS35

MXT®-50 Columns (Siltek®-treated stainless steel)

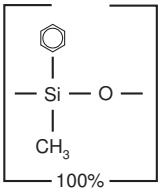
(midpolarity phase; Crossbond® phenyl methyl polysiloxane)

- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, and sterols.
- Temperature range: 0 °C to 300 °C.
- Equivalent to USP G3 phase.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.53 mm	0.83 µm	0 to 280/300 °C		70569	
	1.00 µm	0 to 260/280 °C	70552	70555	70558
	1.50 µm	0 to 250/280 °C	70567	70570	70573

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-50 Structure



Similar to: (50%-phenyl)-methylpolysiloxane

MXT®-65 Columns (Siltek®-treated stainless steel)

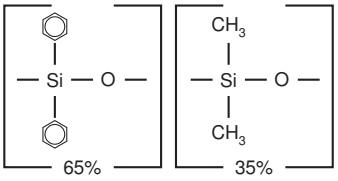
(mid to high polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- General-purpose columns for phenols, triglycerides, and fatty acids.
- Temperature range: 50 °C to 300 °C.
- Equivalent to USP G17 phase.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.25 µm	50 to 300 °C	77020	77023
	0.50 µm	50 to 280/300 °C	77035	77038
	1.00 µm	50 to 280/300 °C	77050	77053

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-65 Structure



Similar to: (65%-phenyl)-methylpolysiloxane

MXT®-1301 Columns (Siltek®-treated stainless steel)

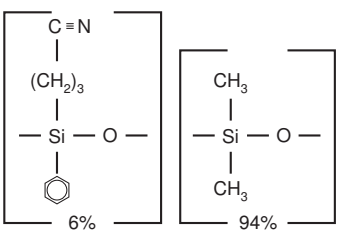
(low to midpolarity phase; Crossbond® cyanopropylphenyl dimethyl polysiloxane)

- General-purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	-20 to 280 °C	76020	76023	76026
	1.00 µm	-20 to 260/280 °C	76050	76053	76056
0.28 mm	0.25 µm	-20 to 280 °C	76021	76024	76027
	1.00 µm	-20 to 260/280 °C	76051	76054	76057
	1.50 µm	-20 to 250/280 °C	76066	76069	76072
0.53 mm	0.25 µm	-20 to 280 °C	76022	76025	76028
	1.00 µm	-20 to 260/280 °C	76052	76055	76058
	1.50 µm	-20 to 250/280 °C	76067	76070	76073
	3.00 µm	-20 to 240/280 °C	76082	76085	76088

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-1301 Structure

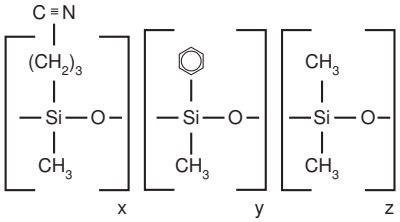


Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar column

DB-PS1301

MXT®-1701 Structure



Similar to: (14%-cyanopropylphenyl)-methylpolysiloxane

similar column

DB-PS1701

MXT®-1701 Columns (Siltek®-treated stainless steel)

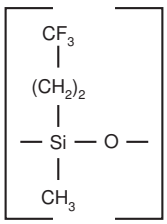
(midpolarity Crossbond® phase)

- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), and pesticides.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G46 phase.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.25 µm	-20 to 280 °C	72020	72023	72026
	1.00 µm	-20 to 260 °C	72050	72053	72056
0.28 mm	0.25 µm	-20 to 280 °C	72021	72024	72027
	1.00 µm	-20 to 260 °C	72051	72054	72057
	1.50 µm	-20 to 250 °C	72066	72069	72072
0.53 mm	0.25 µm	-20 to 280 °C	72022	72025	72028
	0.50 µm	-20 to 260/280 °C	72037	72040	72043
	1.00 µm	-20 to 260 °C	72052	72055	72058
	1.50 µm	-20 to 250 °C	72067	72070	72073
	3.00 µm	-20 to 240 °C	72082	72085	72088

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-200 Structure



Similar to: (trifluoropropyl)-methylpolysiloxane

MXT®-200 Columns (Siltek®-treated stainless steel)

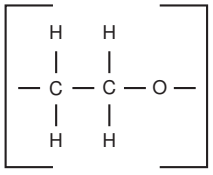
(midpolarity phase; Crossbond® trifluoropropylmethyl polysiloxane)

- General-purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, and glycols. Excellent confirmation column with an Rtx®-5 column, for phenols, nitrosamines, organochlorine pesticides, chlorinated hydrocarbons, and chlorophenoxy herbicides.
- Temperature range: -20 °C to 400 °C.
- Equivalent to USP G6 phase.

ID	df	temp. limits*	15-Meter	30-Meter	60-Meter
0.25 mm	0.50 µm	-20 to 310/400 °C	75035	75038	
	1.00 µm	-20 to 290/360 °C	75050	75053	
0.53 mm	1.00 µm	-20 to 290/360 °C	75052	75055	75058
	1.50 µm	-20 to 280/360 °C	75067	75070	75073
	3.00 µm	-20 to 260/360 °C	75082	75085	75088

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-WAX Structure



similar columns

DB-PSWAX, UAC-CW

MXT®-WAX Columns (Siltek®-treated stainless steel)

(polar phase; Crossbond® Carbowax® polyethylene glycol—provides oxidation resistance)

- General-purpose columns for FAMEs, flavor compounds, essential oils, amines, solvents, xylene isomers, and U.S. EPA Method 603 (acrolein/acrylonitrile).
- Temperature range: 40 °C to 260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.

ID	df	temp. limits	15-Meter	30-Meter	60-Meter
0.25 mm	0.10 µm	40 to 250/260 °C	70605	70608	70611
	0.25 µm	40 to 250/260 °C	70620	70623	70626
	0.50 µm	40 to 250/260 °C	70635	70638	70641
0.28 mm	0.25 µm	40 to 250/260 °C	70621	70624	70627
	0.50 µm	40 to 250/260 °C	70636	70639	70642
	1.00 µm	40 to 240/250 °C	70651	70654	70657
0.53 mm	0.25 µm	40 to 250/260 °C	70622	70625	70628
	0.50 µm	40 to 250/260 °C	70637	70640	70643
	1.00 µm	40 to 240/250 °C	70652	70655	70658
	1.50 µm	40 to 230/250 °C	70666	70669	70672
	2.00 µm	40 to 220/250 °C	70667	70670	

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Volatile Organics Analysis

MXT®-502.2 Columns (Siltek®-treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns with unique selectivity for volatile organic pollutants, cited in U.S. EPA Method 502.2 and in many gasoline range organics (GRO) methods for monitoring underground storage tanks. Excellent separation of trihalomethanes; ideal polarity for light hydrocarbons and aromatics.
- Temperature range: -20 °C to 320 °C.

An MXT®-502.2 column will enable you to quantify all compounds listed in U.S. EPA Methods 502.2 or 524.2, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based MXT®-502.2 stationary phase provides low bleed and thermal stability to 320 °C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling.

ID	df	temp. limits*	30-Meter	60-Meter	105-Meter
0.25 mm	1.40 µm	-20 to 250/320 °C	70915	70916	
0.28 mm	1.60 µm	-20 to 250/320 °C	70919	70920	70921
0.53 mm	3.00 µm	-20 to 250/320 °C	70908	70909	70910

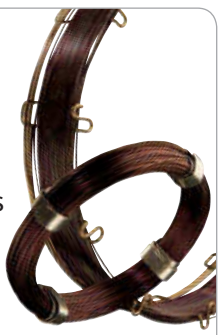
ID	df	temp. limits	10-Meter	20-Meter
0.18 mm	1.00 µm	-20 to 250/320 °C	71891	71892

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

similar column
DB-PS502.2

also available
Metal MXT® PLOT Columns

See **page 113.**



MXT®-Volatiles Columns (Siltek®-treated stainless steel)

(proprietary Crossbond® diphenyl/dimethyl polysiloxane phase)

- Application-specific columns for volatile organic pollutants.
- Temperature range: -20 °C to 320 °C.

MXT®-Volatiles columns were the first columns designed specifically for analyses of the 34 volatile organic pollutants listed in U.S. EPA Methods 601, 602, and 624. With these columns, you can quantify all compounds listed in these methods, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based MXT®-Volatiles stationary phase provides low bleed and thermal stability to 320 °C.

ID	df	temp. limits*	30-Meter	60-Meter	105-Meter
0.25 mm	1.00 µm	-20 to 280/320 °C	70900	70903	
0.28 mm	1.25 µm	-20 to 280/320 °C	70924	70926	70928
0.53 mm	2.00 µm	-20 to 280/320 °C	70925	70927	70929
	3.00 µm	-20 to 250/320 °C	70922	70923	

*Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

MXT®-624 Columns (Siltek®-treated stainless steel)

(low to midpolarity phase; Crossbond® cyanopropylphenyl dimethyl polysiloxane)

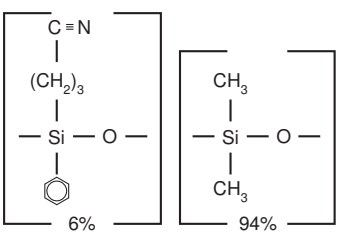
- Application-specific columns for volatile organic pollutants. Recommended in U.S. EPA methods for volatile organic pollutants.
- Temperature range: -20 °C to 280 °C.
- Equivalent to USP G43 phase.

The unique polarity of "624" columns makes them ideal for analyses of volatile organic pollutants. Although the MXT®-502.2 column is recommended in many methods, MXT®-624 columns offer the best separation of the early-eluting gases.

ID	df	temp. limits	30-Meter	60-Meter
0.25 mm	1.40 µm	-20 to 240/280 °C	70968	70969
0.53 mm	3.00 µm	-20 to 240/280 °C	70971	70973

ID	df	temp. limits	10-Meter	20-Meter
0.18 mm	1.00 µm	-20 to 240/280 °C	71893	71894

MXT®-624 Structure

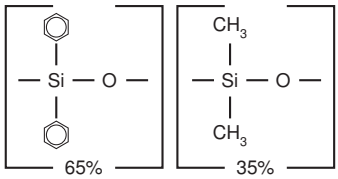


Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane

similar columns
DB-PS624, UAC-624

Triglycerides in Foods Analysis

MXT®-65TG Structure



Similar to: (65%-phenyl)-methylpolysiloxane

similar column
UAC-65HT

MXT®-65TG Columns (Siltek®-treated stainless steel)
(high polarity phase; Crossbond® diphenyl dimethyl polysiloxane)

- Application-specific columns, specially tested for triglycerides.
- Stable to 370 °C.

The MXT®-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number. Because of the chemistry required to achieve 370 °C thermal stability, an MXT®-65TG column should not be used for analyses of compounds that contain active oxygenated groups.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	0.10 µm	20 to 370 °C	77005	77008
0.53 mm	0.10 µm	20 to 370 °C	77007	77010

free literature
MXT® Capillary Columns: Ideal for High Temperature GC Analysis

Download your free copy from **www.restek.com**

lit. cat.# GNTS1368A

MXT® Columns Are Sized to Order!

For your convenience, not only are MXT® columns available in the standard 4.5" coil diameter, but they also are available in 3.5" and 6" coil diameters. Whether you're using them in a process GC or a benchtop GC, our MXT® columns will be a perfect fit. Just add one of the suffix numbers below to the column part number when you order! Additional sizes and configurations may be available; call for details.

Coil Diameter	Suffix Number	Configuration*
3.5"	-273	Bundled
4.5"	None	Standard Banded
6.0"	-276	Bundled

*Standard configuration may vary for PLOT columns.

Connect transfer lines or guard columns directly to your MXT® columns without compromising your data.

Rugged MXT® low dead volume connectors are Siltek® treated to make them inert to active compounds, just like our MXT® columns! They can be used at temperatures up to 430 °C without degrading the deactivated layer, and their low thermal mass tracks rapid oven temperature programming. Kits are available for 0.28 mm, 0.32 mm, and 0.53 mm ID columns in a standard configuration for column-to-column connections and a "Y" configuration for connecting two columns to one inlet or one column to two detectors. In addition to the MXT® union, each kit also contains stainless steel 1/32-inch ferrules and nuts.

See **page 213** for product listing.

Biodiesel Fuels Analysis

MXT®-Biodiesel TG Columns (Siltek®-treated stainless steel)

- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430 °C for reliable, consistent performance.

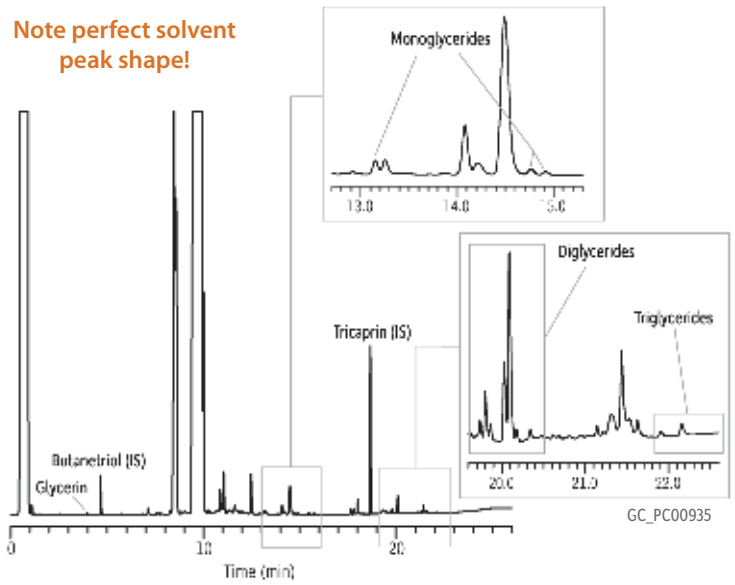
Description	temp. limits	3.5" Coil cat.#	7" diameter 11-pin cage cat.#
14 m, 0.53 mm ID, 0.16 µm with 2 m Integra-Gap*	-60 to 380/430 °C	70289-273	70289
10 m, 0.32 mm ID, 0.10 µm	-60 to 380/430 °C		70292
10 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm Retention Gap**	-60 to 380/430 °C	70290-273	70290
15 m, 0.32 mm ID, 0.10 µm	-60 to 380/430 °C		70293
15 m, 0.32 mm ID, 0.10 µm with 2 m x 0.53 mm Retention Gap**	-60 to 380/430 °C	70291-273	70291
2 m x 0.53 mm MXT Biodiesel TG Retention Gap			70294

*Total column length = 16 meters.
**Connected with low dead volume MXT connector.

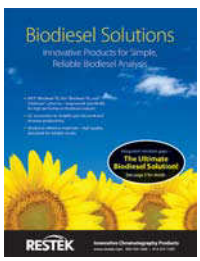
similar column
MET-Biodiesel

ASTM D6584 Derivatized B100 and Internal Standards on MXT®-Biodiesel TG

Note perfect solvent peak shape!



Column MXT®-Biodiesel TG w/2 m x 0.53 mm retention gap, 10 m, 0.32 mm ID, 0.10 µm (cat.# 70290)
Sample B100 + IS butanetriol & tricaprin derivatized with MSTFA as per ASTM D6584
Injection
Inj. Vol.: 1.0 µL cold on-column
Temp. Program: oven track
Oven
Oven Temp: 50 °C (hold 1 min) to 180 °C at 15 °C/min to 230 °C at 7 °C/min to 430 °C at 30 °C/min (hold 5 min)
Carrier Gas H_2, constant flow
Flow Rate: 4 mL/min
Detector FID @ 430 °C



free literature
Biodiesel Solutions: Innovative Products for Simple, Reliable Biodiesel Analysis
Download your free copy from
www.restek.com
lit. cat.# PCFL1409-UNV

Simulated Distillation Analysis (C5-C44)

MXT®-2887 Column (Siltek®-treated stainless steel)
(nonpolar phase; Crossbond® 100% dimethyl polysiloxane—for simulated distillation)

- Application-specific columns for simulated distillation.
- Stable to 400 °C.

MXT®-2887 columns' stationary phase, column dimensions, and film thicknesses have been optimized to exceed the resolution and skewing factor requirements specified in ASTM Method D2887. Each column is individually tested to guarantee a stable baseline with low bleed and reproducible retention times. The Crossbond® methyl silicone stationary phase has increased stability compared to packed columns, ensuring stable baselines and shorter conditioning times. Manufactured from Siltek®-treated stainless steel tubing, MXT® columns are the most durable high temperature GC columns available.

ID	df	temp. limits	10-Meter
0.53 mm	2.65 µm	-60 to 360/400 °C	70199

similar column
DB-PS2887

free literature
Rtx®-2887/ MXT®-2887
Restek's Capillary GC Columns for Simulated Distillation of Petroleum Fractions
Download your free copy from
www.restek.com
lit. cat.# 59567B

similar columns

DB-HT SimDis ProSteel, CP-SimDist UltiMetal, ZB-1X SimDist

Method Recommended Columns

ASTM Method	Hydrocarbon Range	cat. #	Configuration
D2887	C5 - C44	70131	5 m x 0.53 mm, 0.88 µm
		70132	10 m x 0.53 mm, 2.65 µm
D7213 (D2887-ext)	C5 - C60	70131	5 m x 0.53 mm, 0.88 µm
		70115	5 m x 0.53 mm, 0.20 µm
		70112	5 m x 0.53 mm, 0.10 µm
D3710	gasoline up to C14	70132	10 m x 0.53 mm, 2.65 µm
D5307	crude up to C42	70115	5 m x 0.53 mm, 0.20 µm
D6352	C10 - C90	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm
D7500	C7 - C110	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm
D7169	C5 - C100	70112	5 m x 0.53 mm, 0.10 µm
		70115	5 m x 0.53 mm, 0.20 µm

Simulated Distillation Analysis (C5-C110)

MXT®-1HT SimDist Column (Siltek®-treated stainless steel)
(nonpolar phases)

- Stable up to 450 °C—lowest bleed for longest column lifetime.
- Reliably meet all ASTM D6352, D7169, and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.

Accurate boiling point determination for medium and heavy fractions using GC simulated distillation requires columns and phase polymers that are robust enough to withstand high temperatures without significant degradation. Metal columns are a better alternative than fused silica, and the MXT®-1HT SimDist columns are the lowest bleed, highest efficiency columns available, outperforming other metal columns for critical method parameters.

ID	df	temp. limits	5-Meter	10-Meter
0.53 mm	0.10 µm	-60 to 400/450 °C	70112	
	0.20 µm	-60 to 400/430 °C	70115	
	0.21 µm	-60 to 400/430 °C		70118
	0.88 µm	-60 to 380/430 °C	70131	70134
	1.00 µm	-60 to 380/400 °C		70130
	1.20 µm	-60 to 380/380 °C		70119
	2.65 µm	-60 to 360/400 °C		70132
	5.00 µm	-60 to 360/400 °C		70133

Low Bleed, High Efficiency MXT®-1HT SimDist Columns Outperform Competitors for Simulated Distillation (ASTM D6352)

Lower bleed means:

- Longer column lifetime.
- More stable calibrations.
- Accurate boiling point determinations.

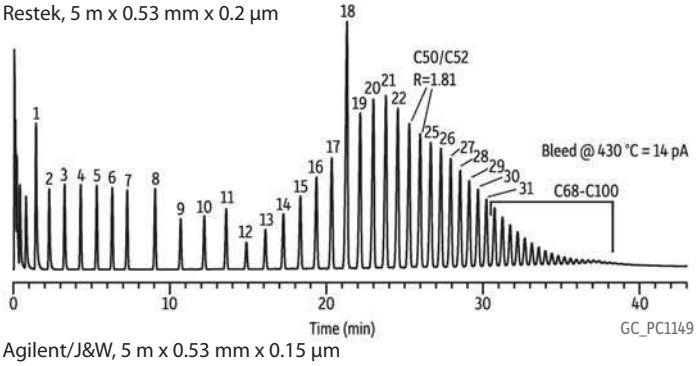
RESTEK ADVANTAGE:
Longer column lifetime and more accurate data!

Higher efficiency means:

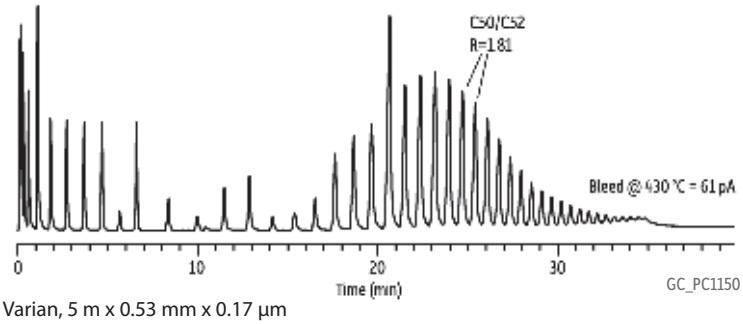
- Greater resolution; analyze more samples before method criteria are reached.
- Assured method performance.

RESTEK ADVANTAGE:
Run more samples within method specifications!

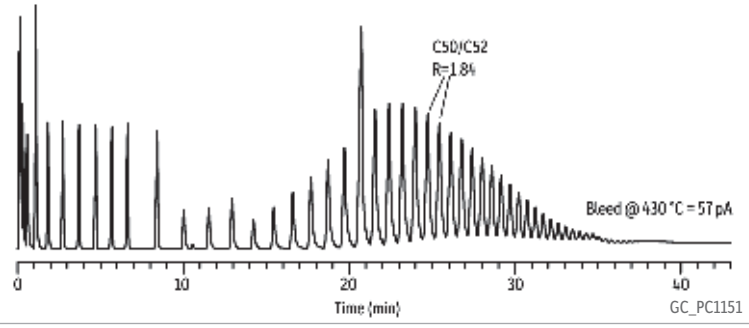
Restek, 5 m x 0.53 mm x 0.2 µm



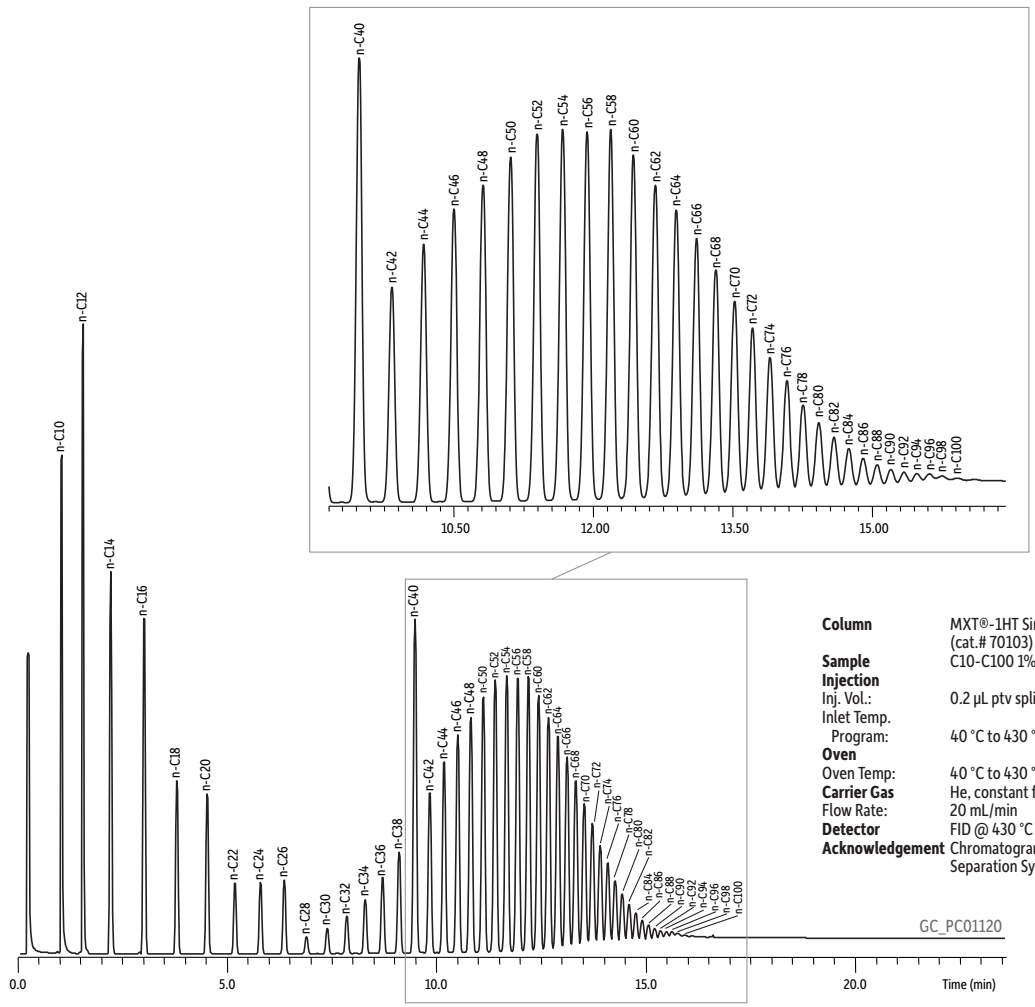
Agilent/J&W, 5 m x 0.53 mm x 0.15 µm



Varian, 5 m x 0.53 mm x 0.17 µm



Hydrocarbons (C10-C100) on MXT®-1HT Sim Dist



Column	MXT®-1HT SimDist, 5 m, 0.53 mm ID, 0.20 µm (cat.# 70103)
Sample	C10-C100 1% in carbon disulfide
Injection	
Inj. Vol.:	0.2 µL ptv splitless
Inlet Temp. Program:	40 °C to 430 °C at 100 °C/min
Oven	
Oven Temp:	40 °C to 430 °C at 25 °C/min
Carrier Gas	He, constant flow
Flow Rate:	20 mL/min
Detector	FID @ 430 °C
Acknowledgement	Chromatograms courtesy of Joaquin Lubkowitz, Separation Systems, Gulf Breeze, FL.

MXT®-1 SimDist/MXT®-500 SimDist

- Application-specific columns in unbreakable Siltek®-treated stainless steel tubing meet all resolution criteria for high temperature simulated distillation (e.g., ASTM Method D2887 Extended).
- MXT®-1HT SimDist and MXT®-1 SimDist phases offer true methyl silicone polarity; MXT®-500 SimDist phase is a carborane siloxane polymer.
- Stable to 430 °C.

MXT®-1 SimDist Column (Siltek®-treated stainless steel)

(nonpolar phase)

ID	df	temp. limits	6-Meter
0.53 mm	0.15 µm	-60 to 400/430 °C	70101

MXT®-500 SimDist Column (Siltek®-treated stainless steel)

(nonpolar phase)

ID	df	temp. limits	6-Meter
0.53 mm	0.15 µm	-60 to 420/430 °C	70104

Polywax® Calibration Materials

Description	qty.	cat.#
Polywax 655 calibration material	1 g	36225
Polywax 1,000 calibration material	1 g	36227

free literature

GC Analysis of Petroleum Products by Simulated Distillation, Using MXT® SimDist Columns

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lit. cat.# 59551A

similar columns

DB-HT SimDis ProSteel, CP-SimDist UltiMetal, ZB-1X SimDist

similar column

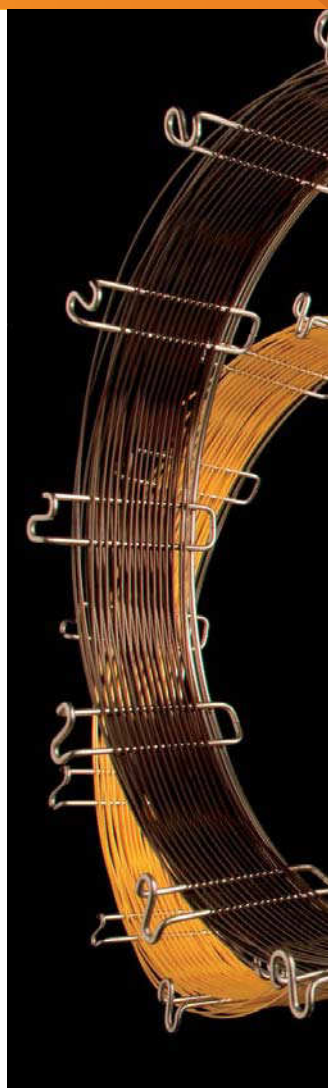
UAC-DX30

GC Columns

PLOT Columns

Next Generation GC PLOT Columns

- Innovative bonding process minimizes particle release, reducing column blockage and protecting instrument parts.
- More consistent flow means stable retention times in Deans and related flow switching techniques.
- Outstanding peak symmetry improves impurity analysis for gases, solvents, and hydrocarbons.



Quick Reference Chart

PLOT Column	Application
Rt-Alumina BOND/Na_2SO_4 (p. 106) MXT-Alumina BOND/Na_2SO_4 (p. 113)	C1–C5 hydrocarbons Purity analysis of ethylene, propylene, butenes, butadiene
Rt-Alumina BOND/KCl (p. 107)	C1-C10 hydrocarbons, C1-C5 isomers Purity analysis of ethylene, propylene, butene, butadiene.
Rt-Alumina BOND/CFC (p. 108)	Multi-halogenated alkanes, C1-C-5 range CFCs (chlorofluorocarbons)
Rt-Alumina BOND/MAPD (p. 109) MXT-Alumina BOND MAPD (p. 113)	Trace analysis of methylacetylene, propadiene, acetylene
Rt-Msieve 5A (p. 110) MXT-Msieve 5A (p. 113)	Permanent gas analysis (polarity between Q-BOND and S-BOND) He, Ne, Ar, O_2, N_2, Xe, Rn, SF6, and CH_4, C_2H_6, CO
Rt-Q-BOND (p. 111) MXT-Q-BOND (p. 113)	Nonpolar porous polymer High retention for solvents, alcohols, polar volatiles, CO_2, sulfur, and ppm water in solvents
Rt-QS-BOND (p. 112)	Intermediate polarity porous polymer Neutral solvents, ketones, esters, hydrocarbons, and baseline separation of ethane, ethene, acetylene
Rt-S-BOND (p. 112) MXT-S-BOND (p. 113)	Intermediate polarity porous polymer Light gases in ethylene and propylene, ketones, esters, hydrocarbons
Rt-U-BOND (p. 112)	Polar porous polymer More retention for polar compounds

PLOT Column Phase Cross-Reference: Similar Selectivity

Restek	Porous Layer	Agilent	Supelco
Rt-Alumina BOND/Na_2SO_4 (p. 106) MXT-Alumina BOND/Na_2SO_4 (p. 113)	Aluminum oxide	GS-Alumina, CP-Al_2O_3/Na_2SO_4	Alumina-Sulfate
Rt-Alumina BOND/KCl (p. 107)	Aluminum oxide	GS-Alumina/KCl, HP-PLOT Al_2O_3/KCl, CP-Al_2O_3/KCl	Alumina-Chloride
Rt-Alumina BOND/CFC (p. 108)	Aluminum oxide	**Restek innovation**	
Rt-Alumina BOND/MAPD (p. 109) MXT-Alumina BOND MAPD (p. 113)	Aluminum oxide	Select Al_2O_3 MAPD	
Rt-Msieve 5A (p. 110), MXT-Msieve 5A (p. 113)	Molecular sieve 5A	HP PLOT Molsieve, CP-Molsieve 5A	Molsieve 5A
Rt-Q-BOND (p. 111), MXT-Q-BOND (p. 113)	100% Divinylbenzene	HP PLOT Q, CP-PoraPLOT Q, CP-PoraBond Q	Supel-Q-PLOT
Rt-QS-BOND (p. 112)	Intermediate polarity porous polymer	GS-Q	
Rt-S-BOND (p. 112), MXT-S-BOND (p. 113)	DVB vinylpyridine polymer	CP-PoraPLOT S	
Rt-U-BOND (p. 112)	DVB ethylene glycol - dimethylacrylate polymer	HP-PLOT U, CP-PoraPLOT U, CP-PoraBond U	

Next Generation of Porous Layer Open Tubular (PLOT) Columns

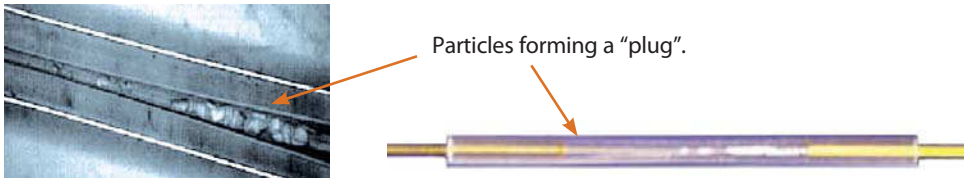
- Stabilized particle layers improve robustness and reproducibility of retention and flow.
- Fully compatible with valve switching and Deans switching systems.
- Highly efficient, reproducible analyses; ideal for permanent gases, solvents, and hydrocarbons.
- Innovative manufacturing procedure reduces particle generation and improves performance of porous polymer and molecular sieve PLOT columns.
- Wound on a 7"-diameter, 11-pin cage, unless otherwise noted.
- Available in fused silica and metal MXT® tubing.

Porous layer open tubular (PLOT) columns are very beneficial for solving application problems, especially for the analysis of volatile compounds. PLOT columns have a unique selectivity, allowing for the separation of gaseous compounds at room temperature. Due to the adsorption mechanism of the supports used in PLOT columns, permanent gases and light hydrocarbons can be resolved at room temperature; columns can then be programmed to higher temperatures to elute higher boiling compounds.

Traditional PLOT Columns Offer Poor Stability

The traditional PLOT column is built with a 5–50 µm layer of particles adhered to the tubing walls. Because this layer of particles generally lacks stability, PLOT columns must be used very carefully, as particle release is common and can cause unpredictable changes in retention time and flow behavior. Traditional PLOT columns also must generally be used in conjunction with particle traps to prevent the contamination of valves, injectors, and GC detectors. Detectors contaminated with particles typically generate electronic noise, which shows up chromatographically as a spike in the baseline. In extreme cases, detector flow can be obstructed by particle buildup. Particles can also affect valves by becoming lodged in the valve and causing leaks or restricting flow. Figure 1 shows an example of blockage caused by particle accumulation inside a Press-Tight® connector.

Figure 1: Particles released from traditional PLOT columns can cause blockages.



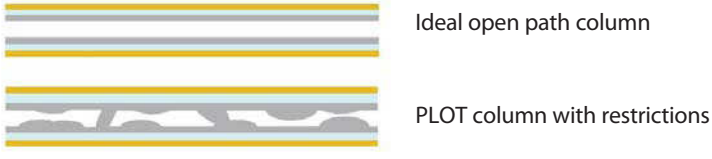
Restek PLOT Columns Offer Improved Stability to Minimize Particle Release

Restek has developed technology and procedures to manufacture PLOT columns with concentric stabilized adsorption layers. These next generation PLOT columns show a constant flow behavior (permeability) and have significantly improved mechanical stability, resulting in easier operation, better chromatography, and reduced particle release. Greater particle stability means more reproducible retention times, virtually no spiking, and longer column lifetimes. This innovative Restek stabilization chemistry is currently applied to all fused silica and metal PLOT columns featured in this catalog.

Consistent Flow Restriction Factor (F) Guarantees Reproducible Flow

Thick layers of particles are difficult to deposit in a homogeneous layer, and in traditionally manufactured PLOT columns, this results in variable coating thicknesses. The positions where the layer is thicker act as restrictions and affect flow (Figure 2). Depending on the number and intensity of these restrictions, traditional PLOT columns often show greater variation in flow restriction than wall coated open tubular (WCOT) columns. In practice, conventional PLOT columns with the same dimensions can differ in flow by a factor of 4 to 6 when operated at the same nominal pressure. For applications where flow is important, such as with Deans switching, the nonreproducible flow behavior of most commercially available PLOT columns is a problem.

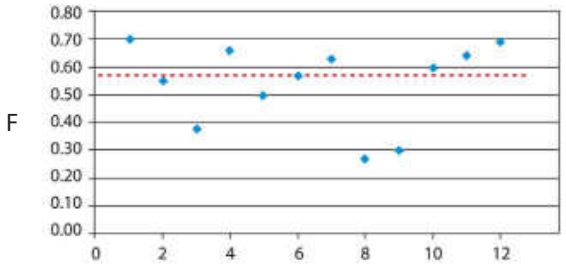
Figure 2: Inconsistent coating thicknesses result in restrictions that cause significant variation in flow.



In order to measure flow restriction reproducibility, Restek has introduced a new factor: the flow restriction factor (F). This factor is based on the retention time of an unretained marker compound, as measured on both coated and uncoated tubing using the same backpressure setting (Equation 1). For quality control purposes, methane is used as the marker when evaluating porous polymer columns and helium is used for testing molecular sieve 5A columns.

Flow restriction factor determination can be used to assess both the degree of column restriction and the reproducibility of the column coating process. Flow restriction can also be calculated (Equation 2). Figure 3 shows typical results for PLOT columns manufactured using a conventional process. Because of the difference in flow restriction, individual columns have very different flow characteristics. In contrast, Figure 4 shows results for columns made using our Rt®-QS-BOND (bonded porous polymer) PLOT column process. Clearly, our manufacturing process results in greater consistency in both column coating thickness and flow restriction, which results in more stable retention times and better performance in Deans and related flow switching techniques.

Figure 3: Traditional PLOT columns show significant flow variability, indicating inconsistent column coating thicknesses.



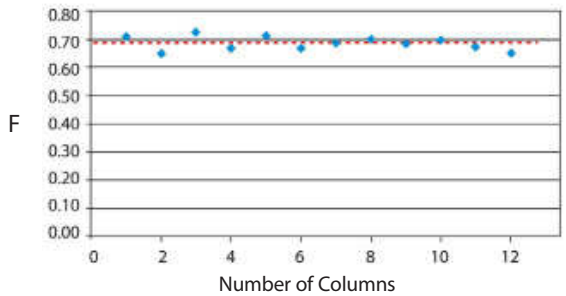
Equation 1: Flow restriction factor (F) is used to demonstrate coating consistency.

$$F = \frac{t_{R1} \text{ of unretained component (uncoated tubing)}}{t_{R2} \text{ of unretained component (coated column)}}$$

t_R = retention time

Note: F values will always be <1 as the coated column always has more restriction than the uncoated column.

Figure 4: PLOT columns from Restek offer consistent flow resistance, giving more reproducible results column-to-column.



Equation 2: Percent flow restriction of coated column.

$$\% \text{ restriction} = (1-F) \times 100$$

Restek's PLOT columns are exceptionally robust, featuring concentric stabilized coating layers. They allow for more consistent gas flows and are recommended for applications sensitive to variation in retention time or flow. These PLOT columns are a significant advance in technology and are ideal for efficient, reproducible analyses of permanent gases, solvents, and hydrocarbons.

Fused Silica, PLOT, & MXT® Capillary GC Column Ferrule Guide

GC Column ID	Ferrule ID
0.10 mm	0.4
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.28 mm	0.4
0.32 mm	0.5
0.45 mm	0.8
0.53 mm	0.8

similar phases

GS-Alumina, CP-Al_2O_3/Na_2SO_4, Alumina-Sulfate

tech tip

Trace Water in the Carrier Gas
Traces of water in the carrier gas and in the sample will affect the retention and the selectivity of alumina. If exposed to water, the retention times will shorten. The column can be regenerated by conditioning for 15–30 min at 200 °C under normal carrier gas flow. Periodic conditioning ensures excellent run-to-run retention time reproducibility.

The maximum programmable temperature for an Rt®-Alumina BOND column is 200 °C. Higher temperatures cause irreversible changes to the porous layer adsorption properties.

Rt®-Alumina BOND Columns

Restek Rt®-Alumina BOND columns are highly selective for C1–C5 hydrocarbons and separate all unsaturated hydrocarbon isomers above ambient temperatures. The reactivity of the aluminum oxide stationary phase is minimized to improve column response for polar unsaturates, such as dienes, and the column's sensitivity (or response) ensures linear and quantitative chromatographic analysis for these compounds. Strong bonding prevents particle generation and release, which allows valve switching without harming the injection or detection systems. And because they are stable up to at least 200 °C, Rt®-Alumina BOND columns can be regenerated to restore full efficiency and selectivity by conditioning at their maximum temperature if water is adsorbed. High capacity and loadability give you exceptionally symmetrical peaks, making these columns ideal for volatile hydrocarbon separations at percent levels, as well as impurity analyses at ppm concentrations. Restek Rt®-Alumina BOND PLOT columns are manufactured on fused silica tubing; select phases are also available on metal MXT® tubing.

Guaranteed Reproducibility

To ensure reproducible retention times and predictable flow behavior column-to-column, each Rt®-Alumina BOND column is extensively tested. A hydrocarbon test mix confirms proper phase retention and selectivity. To calculate k (retention or capacity factor), which is a measure of phase retention, 1,3-butadiene is used, while selectivity is measured using retention indices for propadiene and methyl acetylene. The resolution of *trans*-2-butene and 1-butene is also verified, and to measure efficiency, plates per meter are checked using 1,3-butadiene.

Rt®-Alumina BOND/Na_2SO_4 Columns (fused silica PLOT)

(Na_2SO_4 deactivation)

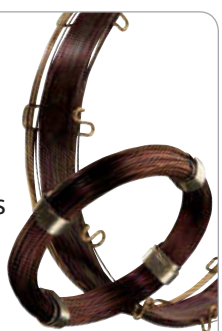
- Acetylene and propadiene elute after butanes.
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.

ID	df	temp. limits	30-Meter	50-Meter
0.25 mm	4 µm	to 200 °C	19775	
0.32 mm	5 µm	to 200 °C	19757	19758
0.53 mm	10 µm	to 200 °C	19755	19756

also available

Metal MXT® PLOT Columns

See **page 113.**



Rt®-Alumina BOND/KCl Columns (fused silica PLOT)

(KCl deactivation)

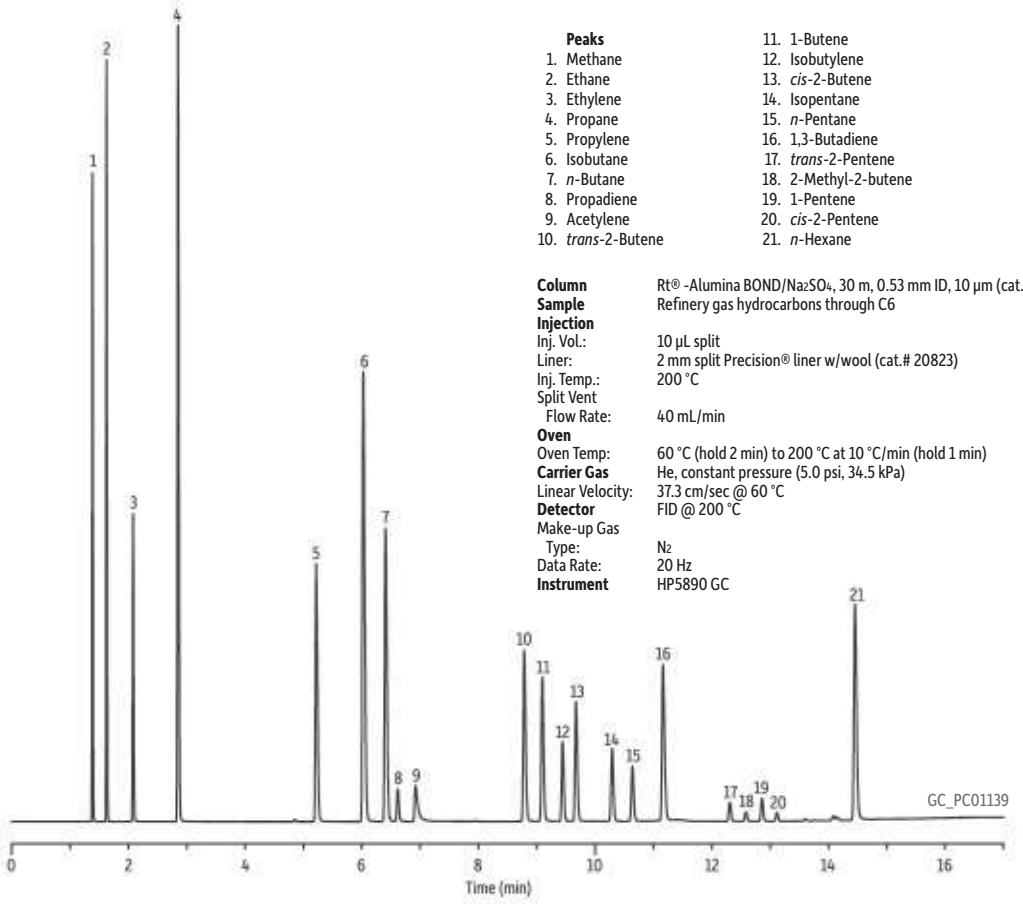
- Restek's lowest polarity alumina column.
- Low moisture sensitivity reduces the need for frequent regeneration.
- Acetylene elutes before *n*-butane.
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.

similar phases

GC-Alumina KCl, HP-PLOT Al_2O_3/KCl, CP-Al_2O_3/KCl, Alumina-Chloride

ID	df	temp. limits	30-Meter	50-Meter
0.25 mm	4 µm	to 200 °C	19776	
0.32 mm	5 µm	to 200 °C	19761	19762
0.53 mm	10 µm	to 200 °C	19759	19760

Refinery Gas Hydrocarbons on Rt®-Alumina BOND/Na_2SO_4



Peaks
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. *n*-Butane
8. Propadiene
9. Acetylene
10. *trans*-2-Butene
11. 1-Butene
12. Isobutylene
13. *cis*-2-Butene
14. Isopentane
15. *n*-Pentane
16. 1,3-Butadiene
17. *trans*-2-Pentene
18. 2-Methyl-2-butene
19. 1-Pentene
20. *cis*-2-Pentene
21. *n*-Hexane

Column	Rt® -Alumina BOND/Na_2SO_4, 30 m, 0.53 mm ID, 10 µm (cat.# 19755)
Sample	Refinery gas hydrocarbons through C6
Injection	
Inj. Vol.:	10 µL split
Liner:	2 mm split Precision® liner w/wool (cat.# 20823)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	40 mL/min
Oven	
Oven Temp:	60 °C (hold 2 min) to 200 °C at 10 °C/min (hold 1 min)
Carrier Gas	He, constant pressure (5.0 psi, 34.5 kPa)
Linear Velocity:	37.3 cm/sec @ 60 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

did you know?

All Restek PLOT columns come standard on a 7"-diameter, 11-pin cage. Metal MXT® columns are also available coiled to 3.5" diameter by adding the suffix -273 to the part number. If you need more information, please call Restek Customer Service at 1-814-353-1300, ext. 3, or your Restek Representative.

Rt®-Alumina BOND/CFC Columns (fused silica PLOT)

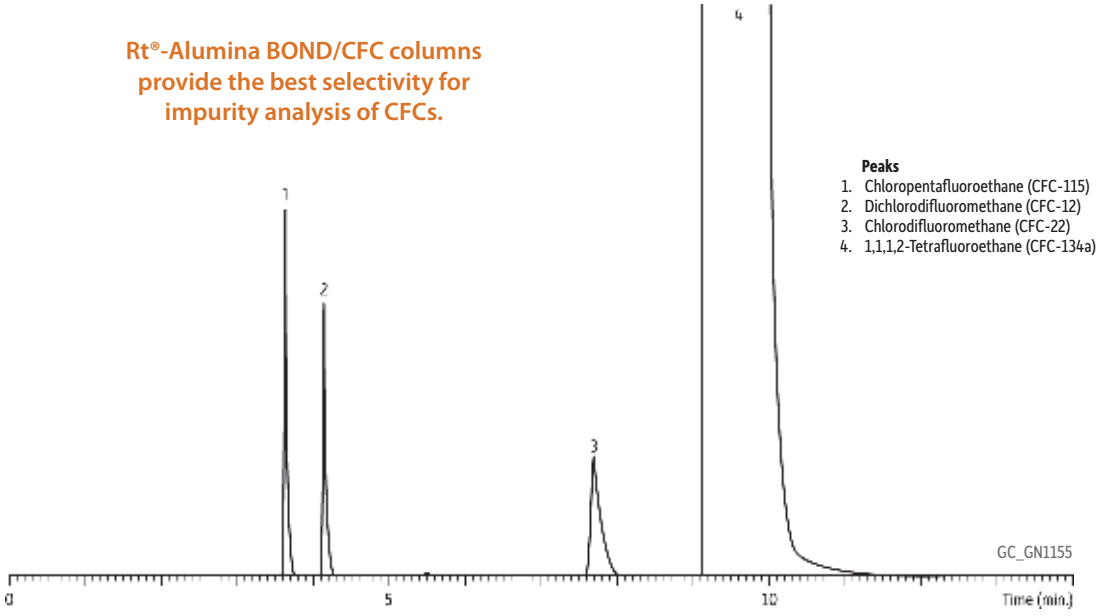
- Improved inertness for chlorofluorocarbon (CFC) compounds.
- Highly selective alumina-based column, separates most CFCs.
- High retention and capacity for CFCs.

The alumina adsorbent is ideal for retaining halogenated compounds, especially CFCs (chlorinated fluorocarbons) like Freon® products. It offers high selectivity, allowing a wide range of CFC isomers to be resolved at above ambient temperatures. The Rt®-Alumina BOND/CFC column is thoroughly deactivated to reduce the reactivity of alumina. Even though there is still some residual reactivity for some mono- or di-substituted CFCs, the majority of these compounds can be accurately quantified from main stream processes or in impurity analyses.

ID	df	temp. limits	30-Meter
0.53 mm	10 µm	to 200 °C	19763

Impurity Analysis of 1,1,1,2-Tetrafluoroethane (CFC-134a) on Rt®-Alumina BOND/CFC

Rt®-Alumina BOND/CFC columns provide the best selectivity for impurity analysis of CFCs.



Column	Rt®-Alumina BOND/CFC, 30 m, 0.53 mm ID (cat.# 19763)
Sample	1,1,1,2-Tetrafluoroethane
Conc.:	Neat
Injection	
Inj. Vol.:	500 µL split
Oven	
Oven Temp:	80 °C (hold 6 min) to 140 °C at 10 °C/min (hold 2 min)
Carrier Gas	He
Detector	FID
Notes	Gas sampling, purity analysis

Note that tailing peaks are common in CFC analyses due to overloading normally employed for this type of work.

Rt®-Alumina BOND/MAPD Columns (fused silica PLOT)

- Optimized deactivation produces maximum response when analyzing trace levels of acetylene, methyl acetylene, and propadiene.
- Stable response factors make this column ideal for process-type applications where recalibration must be minimized.
- High loadability reduces peak tailing and improves separations.
- Extended temperature range up to 250 °C for fast elution of high molecular weight (HMW) hydrocarbons and accelerated column regeneration following exposure to water.

Restek's R&D chemists have optimized the deactivation technology applied to our Rt®-Alumina BOND/MAPD column for improved analysis of trace concentrations of polar hydrocarbons like acetylene, methyl acetylene, and propadiene in hydrocarbon streams containing higher levels of C1-C5 hydrocarbons. Our alumina PLOT deactivation produces an incredibly inert column that offers superior reproducibility and stable response factors to maximize the number of analyses before recalibration is required. Its high sample capacity reduces peak tailing, thereby improving the separation of target compounds. In addition, a 250 °C maximum operating temperature lets you more quickly elute hydrocarbons up to dodecane and reduces regeneration time when the column is exposed to water from samples or carrier gases.

ID	df	temp. limits	30-Meter	50-Meter
0.32 mm	5 µm	to 250 °C	19779	19780
0.53 mm	10 µm	to 250 °C	19777	19778

similar phases

Select Al_2O_3 MAPD

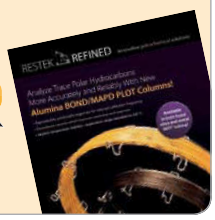
free literature

Analyze Trace Polar Hydrocarbons More Accurately and Reliably With New Alumina BOND/MAPD PLOT Columns

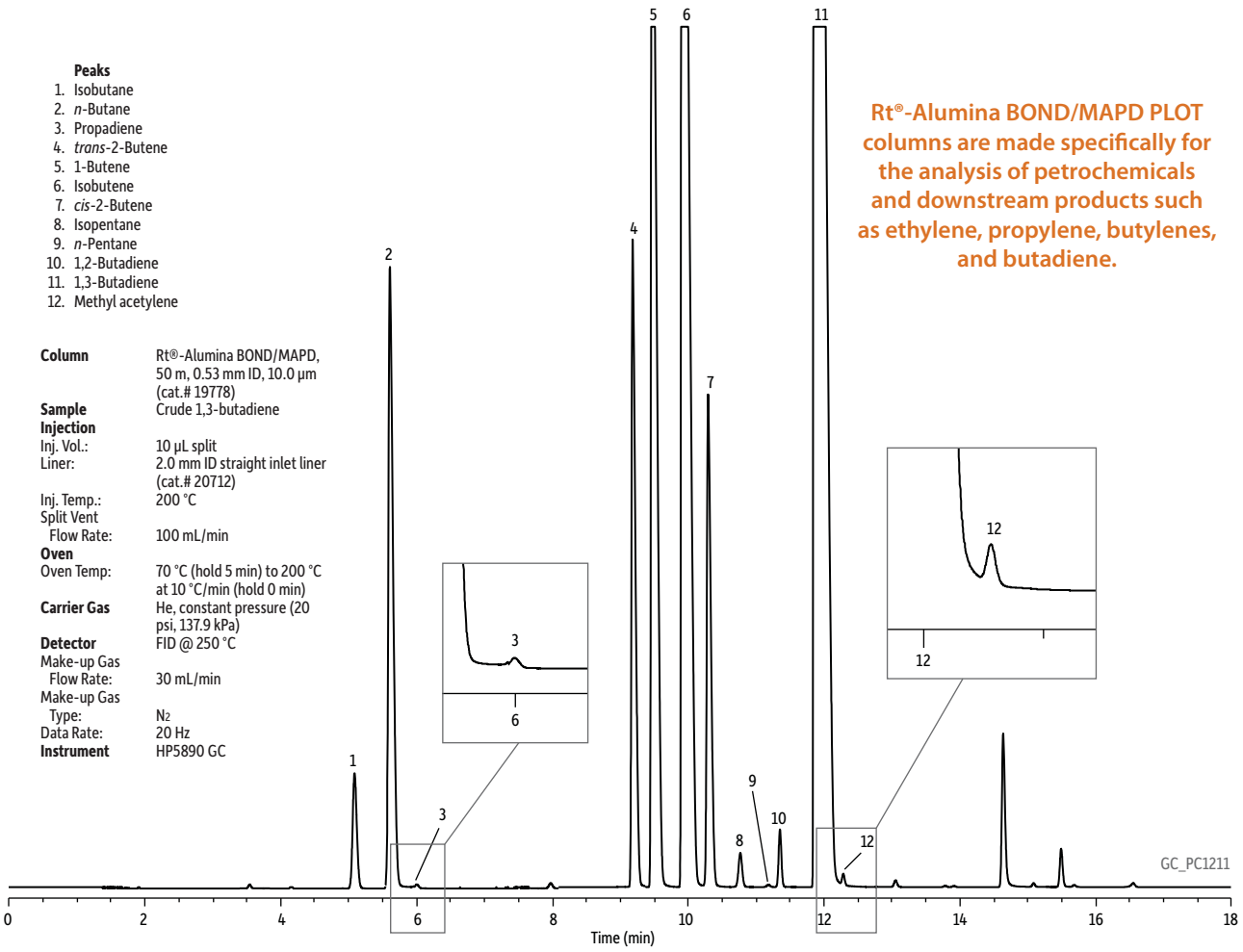
Download your free copy from

www.restek.com

lit. cat.# PCFL1412-UNV



1,3-Butadiene on Rt®-Alumina BOND/MAPD (Purity Analysis)



Rt®-Alumina BOND/MAPD PLOT columns are made specifically for the analysis of petrochemicals and downstream products such as ethylene, propylene, butylenes, and butadiene.

Fused Silica Molecular Sieve 5A Columns

did you know?

Rt®-Msieve 5A PLOT columns are designed for efficient separation of Ar/O_2 and other permanent gases, including CO.

Molecular Sieve 5A PLOT Columns

Restek's molecular sieve 5A PLOT columns are designed for efficient separation of Ar/O_2 and other permanent gases, including CO. Special coating and deactivation procedures ensure chromatographic efficiency and the integrity of the porous layer coating. Molecular sieves have very high retention, allowing separations of permanent gases at temperatures above ambient. Our deactivation technology also allows CO to elute as a sharp peak. Additionally, our unique immobilization process guarantees that the uniform particles remain adhered to the tubing—even after continuous valve-cycling.

Our revolutionary molecular sieve 5A PLOT columns separate Ar/O_2 and H_2/He at ambient temperature or above (see chromatogram). These columns also are an excellent choice for rapid separation of permanent gases in refinery or natural gas.

similar phases

HP PLOT Molsieve, CP-Molsieve 5A, Molsieve 5A, AT-Molsieve, PLT-5A

Rt®-Msieve 5A Columns (fused silica PLOT)

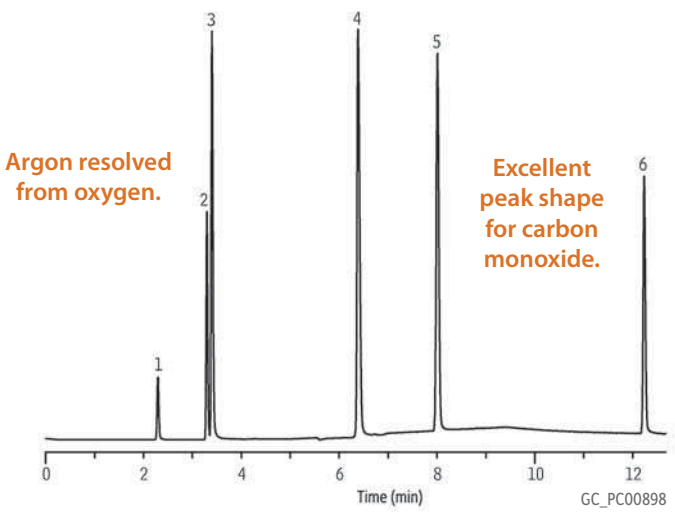
ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	20 µm	to 300 °C	19773	
0.32 mm	30 µm	to 300 °C	19720	19722
0.53 mm	50 µm	to 300 °C	19721	19723

tech tip

Molecular sieve materials are very hydrophilic

Because molecular sieve materials are very hydrophilic, they will adsorb water from the sample or carrier gas. Water contamination can have a detrimental effect on peak symmetry and can reduce the resolution of all compounds. If water contamination occurs, reactivate your Rt®-Msieve 5A PLOT column by conditioning at 300 °C with dry carrier gas flow for 3 hours.

Separation of Argon/Oxygen and Other Permanent Gases on Rt®-Msieve 5A



Peaks	Conc. (µg/mL)
1. Hydrogen	40
2. Argon	30
3. Oxygen	50
4. Nitrogen	50
5. Methane	40
6. Carbon monoxide	50

Column	Rt®-Msieve 5A, 30 m, 0.53 mm ID, 50 µm (cat.# 19723)
Sample	Permanent gases
Injection	Sample valve
Sample Loop Vol.:	5 µL
Valve Name:	6-port Valco® valve
Inj. Temp.:	200 °C
Valve Temp.:	Ambient
Oven	
Oven Temp:	27 °C (hold 5 min) to 100 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	5.0 mL/min
Detector	Valco® helium ionization detector @ 150 °C

also available

Metal MXT® PLOT Columns

See **page 113.**

Porous Polymer Columns

The process used to manufacture porous polymer PLOT columns causes the particles to adhere strongly to the walls of the tubing, so there is virtually no particle generation. You get reproducible performance from column to column, including selectivity and flow.

Rt®-Q-BOND Columns (fused silica PLOT)

100% divinylbenzene

- Nonpolar PLOT column incorporating 100% divinylbenzene.
- Excellent for analysis of C1 to C3 isomers and alkanes up to C12.
- High retention for CO_2 simplifies gas analysis; CO_2 and methane separated from O_2/N_2/CO (Note: O_2/N_2/CO not separated at room temperature).
- Use for analysis of oxygenated compounds and solvents.
- Maximum temperature of 300 °C.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	8 µm	to 280/300 °C	19764	19765
0.32 mm	10 µm	to 280/300 °C	19743	19744
0.53 mm	20 µm	to 280/300 °C	19741	19742

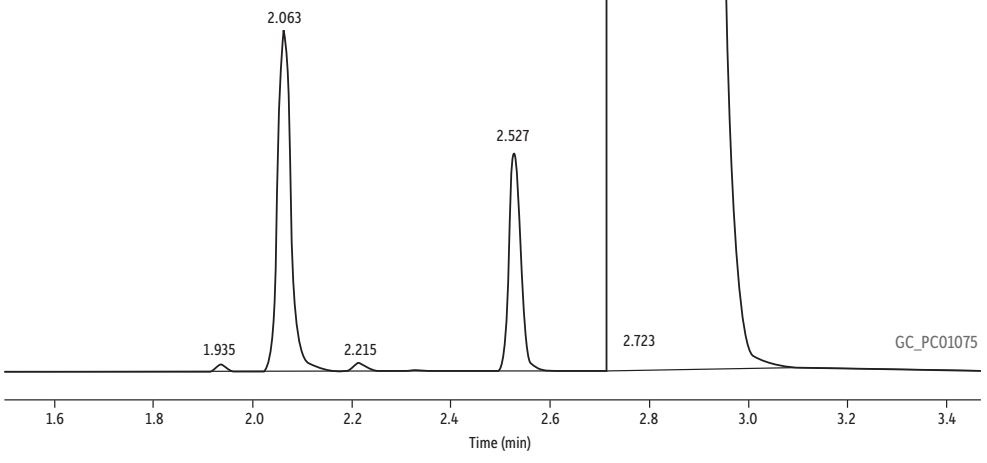
similar phases

HP PLOT Q, CP-PoraPLOT Q, CP-PoraBond Q, Supel-Q-PLOT, AT-Q

Our porous polymer PLOT columns are not moisture sensitive, making them ideal for applications where moisture is of major concern.

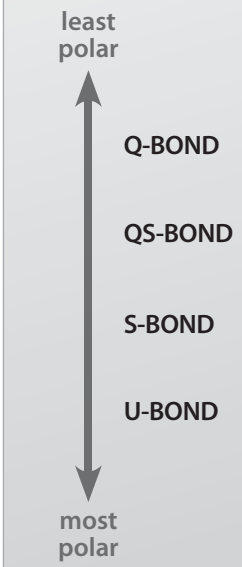
Water and Ethanol in Acetone on Rt®-Q-BOND

Peaks	tR (min)
1. Methane	1.935
2. Water	2.063
3. Methanol	2.215
4. Ethanol	2.527
5. Acetone	2.723



Column	Rt®-Q-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19742)
Sample	
Diluent:	Acetone
Conc.:	0.5% Water and ethanol
Injection	
Inj. Vol.:	3 µL split (split ratio 11:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	200 °C (hold 4 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	28.7 cm/sec @ 200 °C
Detector	TCD @ 260 °C

Restek porous polymer PLOT columns cover a wide range of polarities



Fused Silica Porous Polymer Columns, Particle Trap

Rt®-QS-BOND Columns (fused silica PLOT)

porous divinylbenzene homopolymer

similar phases
GS-Q

- Intermediate polarity PLOT column incorporating low 4-vinylpyridine.
- Separates ethane, ethylene, and acetylene to baseline.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	8 µm	to 250 °C	19767	19768
0.32 mm	10 µm	to 250 °C	19739	19740
0.53 mm	20 µm	to 250 °C	19737	19738

Rt®-S-BOND Columns (fused silica PLOT)

porous divinylbenzene homopolymer

similar phases
CP-PoraPlot S

- Midpolarity PLOT column, incorporating high 4-vinylpyridine.
- Use for the analysis of nonpolar and polar compounds.

ID	df	temp. limits	15-Meter	30-Meter
0.25 mm	8 µm	to 250 °C	19769	19770
0.32 mm	10 µm	to 250 °C	19747	19748
0.53 mm	20 µm	to 250 °C	19745	19746

Rt®-U-BOND Columns (fused silica PLOT)

divinylbenzene ethylene glycol/dimethylacrylate

similar phases
HP-PLOT U, CP-PoraPLOT U, CP-PoraBond U

- Polar PLOT column, incorporating divinylbenzene ethylene glycol/dimethylacrylate.
- Use for the analysis of polar and nonpolar compounds.

ID	df	temp. limits	15-Meter	30-Meter	
0.25 mm	8 µm	to 190 °C	19771	19772	
0.25 mm	12 µm	to 190 °C	19782		NEW!
0.32 mm	10 µm	to 190 °C	19751	19752	
0.53 mm	20 µm	to 190 °C	19749	19750	

19754

PLOT Column Particle Trap

- Includes two Press-Tight® connectors and a 2.5 m column.
- Protects detector and valves; connects between column and detector or valve.
- Eliminates detector spikes and scratches in valve rotors.

The technology used to adhere particles in PLOT columns is excellent; however, there is still a possibility for particles to dislodge when extreme pressure shocks and gas flow changes are anticipated. This sometimes happens when valve switching or backflush is used. In those cases, using particle traps is recommended.

Description	qty.	cat.#
PLOT Column Particle Trap, 2.5 m, 0.32 mm ID with 2 Press-Tight Connectors	ea.	19753
PLOT Column Particle Trap, 2.5 m, 0.53 mm ID with 2 Press-Tight Connectors	ea.	19754

Metal MXT® PLOT Columns

Advantages of metal MXT® PLOT columns include:

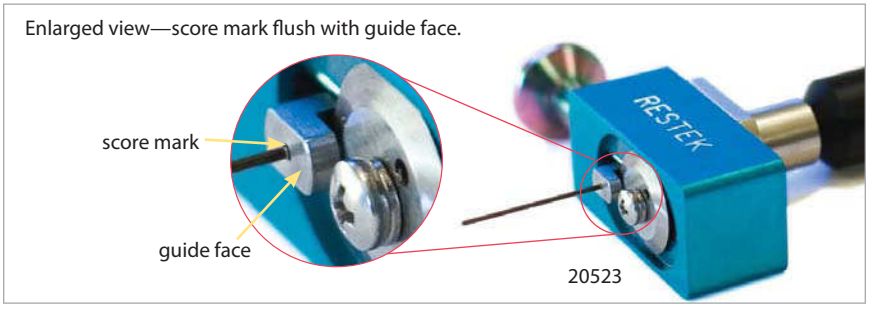
- Can be made in small coil diameters—perfect for tight spaces.
- Rugged material withstands rough handling and shock.
- Designed for robust performance in process GCs and field instruments.
- Available in 3.5"-coil diameter or 7"-diameter, 11-pin cage.

Restek chemists have developed technology that allows many of our popular PLOT columns to be made on Siltek®-treated stainless steel. These columns have the same characteristics and performance as fused silica PLOT columns, but offer several additional benefits for process GCs and field applications.

ID	df	temp. limits	3.5" coil 15-Meter	7" diameter 11-pin cage 15-Meter	3.5" coil 30-Meter	7" diameter 11-pin cage 30-Meter
MXT-Msieve 5A						
0.25 mm	20 µm	to 300 °C	79717-273	79717		
0.53 mm	50 µm	to 300 °C			79723-273	79723
MXT-Alumina BOND/Na_2SO_4						
0.53 mm	10 µm	to 200 °C			79714-273	79714
MXT-Alumina BOND/MAPD						
0.53 mm	10 µm	to 250 °C			79728-273	79728
MXT-Q-BOND						
0.25 mm	8 µm	to 300 °C	79718-273	79718		
0.53 mm	20 µm	to 280/300 °C			79716-273	79716
MXT-S-BOND						
0.53 mm	20 µm	to 250 °C			79712-273	79712

Fused Silica & MXT® Capillary GC Column Ferrule Guide

GC Column ID	Ferrule ID
0.10 mm	0.4
0.15 mm	0.4
0.18 mm	0.4
0.25 mm	0.4
0.28 mm	0.4
0.32 mm	0.5
0.45 mm	0.8
0.53 mm	0.8

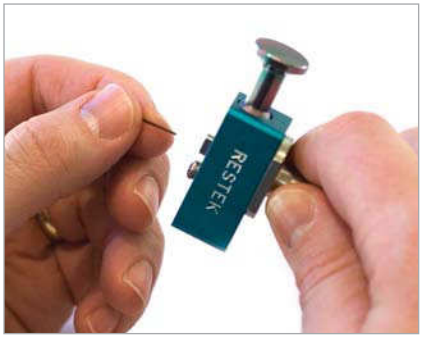


Restek Tubing Scorer for MXT® Columns

- Makes a perfect cut every time.
- Easy to use.
- Leaves column entrance perfectly round.
- Ideal for creating a leak-free seal with connectors and valves.

Metal MXT® columns are easy to cut. Scoring wafers can be used, but may leave the column end irregularly shaped. The Restek tubing scorer is designed to make a perfect cut every time, leaving the column entrance perfectly round.

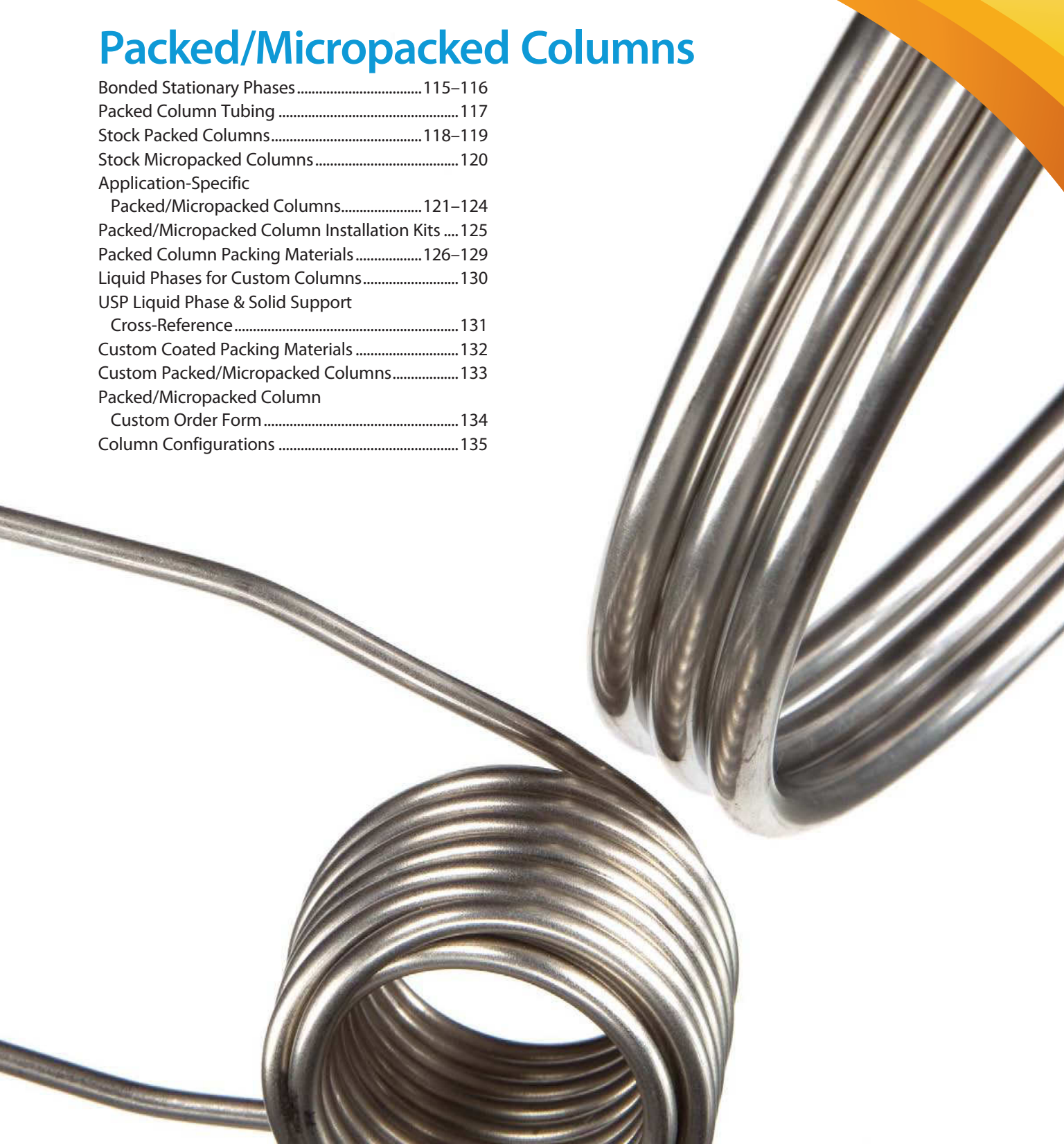
Description	qty.	cat.#
Restek Tubing Scorer for MXT Columns (0.25-0.53 mm ID & 0.5-0.8 mm OD)	ea.	20523
Replacement Scoring Wheel	ea.	20522



Make a perfect column cut every time!

GC Columns

Packed/Micropacked Columns



Bonded Stationary Phases

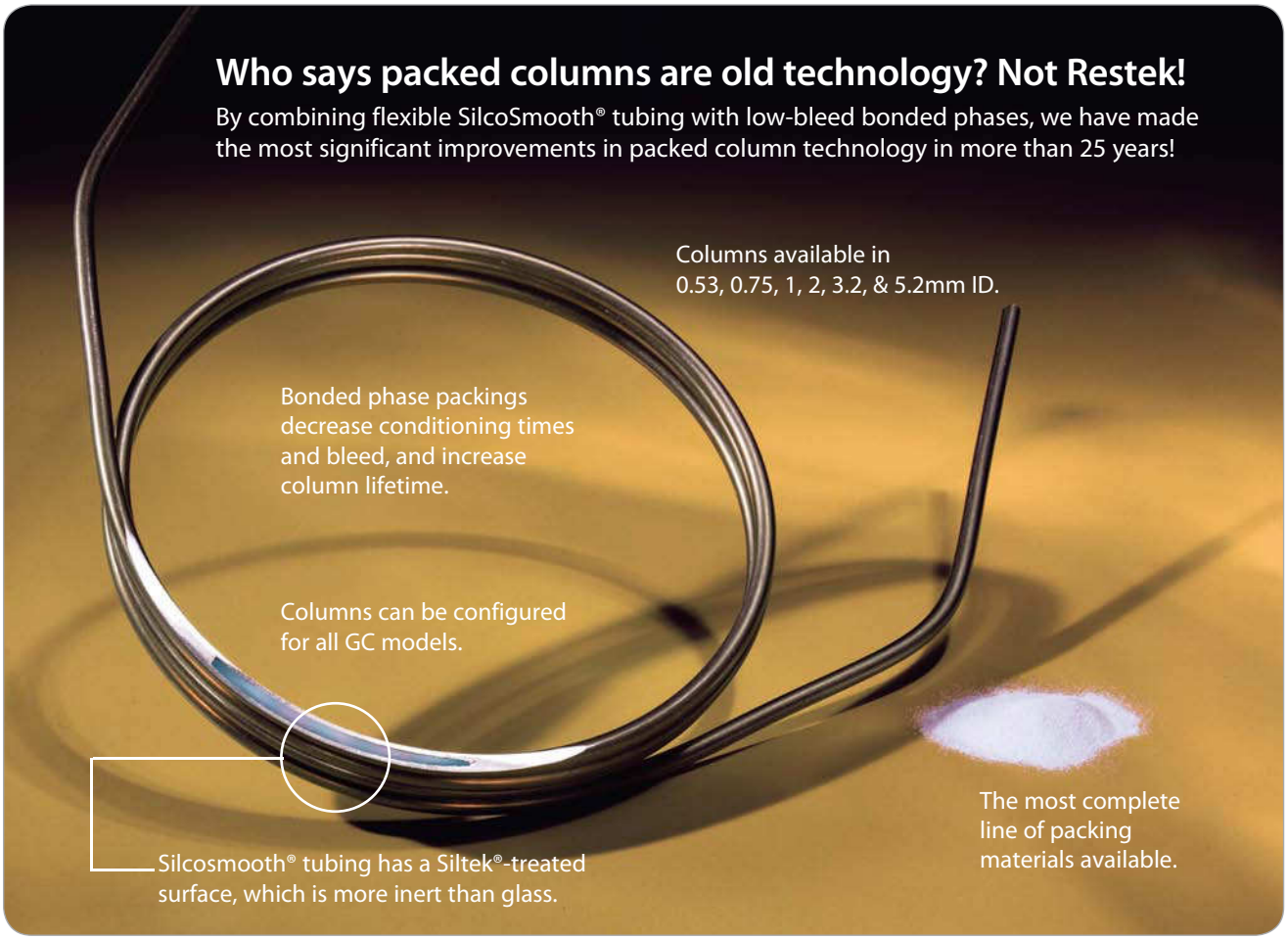
We combined our stationary phase synthesis experience with our unique Silcoport® packing deactivation process to create bonded phase packings that provide longer lifetimes, lower bleed, and shorter conditioning times.

Bonded methyl silicone phases (Rtx®-1 and Rtx®-5 columns) and bonded Carbowax® phase (Stabilwax® columns) are completely cross-linked on Silcoport® packing. We have evaluated Rtx®-1 and Rtx®-5 bonded packed column phases side by side with nonbonded phases of comparable polarity; the bonded phases last longer than the equivalent nonbonded packing materials. Table I shows that retention times on an Rtx®-1 bonded packed column are highly repeatable after only 30 minutes of conditioning.

Table I: Retention data shows the perfect reproducibility of the bonded phase packed columns with respect to retention times.

	Retention Time			
Hydrocarbon	**Min.**	**Max.**	**Mean**	**Stand. Dev.**
C5	0.241	0.243	0.242	0.001
C6	0.493	0.497	0.495	0.002
C10	5.746	5.765	5.752	0.005
C20	18.482	18.491	18.486	0.004
C28	25.093	25.103	25.098	0.004
C40	32.160	32.171	32.166	0.004
C44	34.316	34.328	34.326	0.007

n = 9 columns



Bonded Stationary Phases

Restek's packed columns deliver the

1-2-3 PUNCH!

1. Bonded stationary phases mean short conditioning times, low bleed, and unsurpassed column lifetimes.
2. SilcoSmooth® tubing provides the inertness of glass and the durability of stainless steel.
3. Silcoport® diatomaceous earth provides unsurpassed inertness for trace analysis.

Bonded Packed Column Stationary Phases

- Short conditioning times.
- Reproducible bonded phase selectivity.
- Low bleed levels.
- Longer column lifetimes.
- Unsurpassed inertness for active compounds.

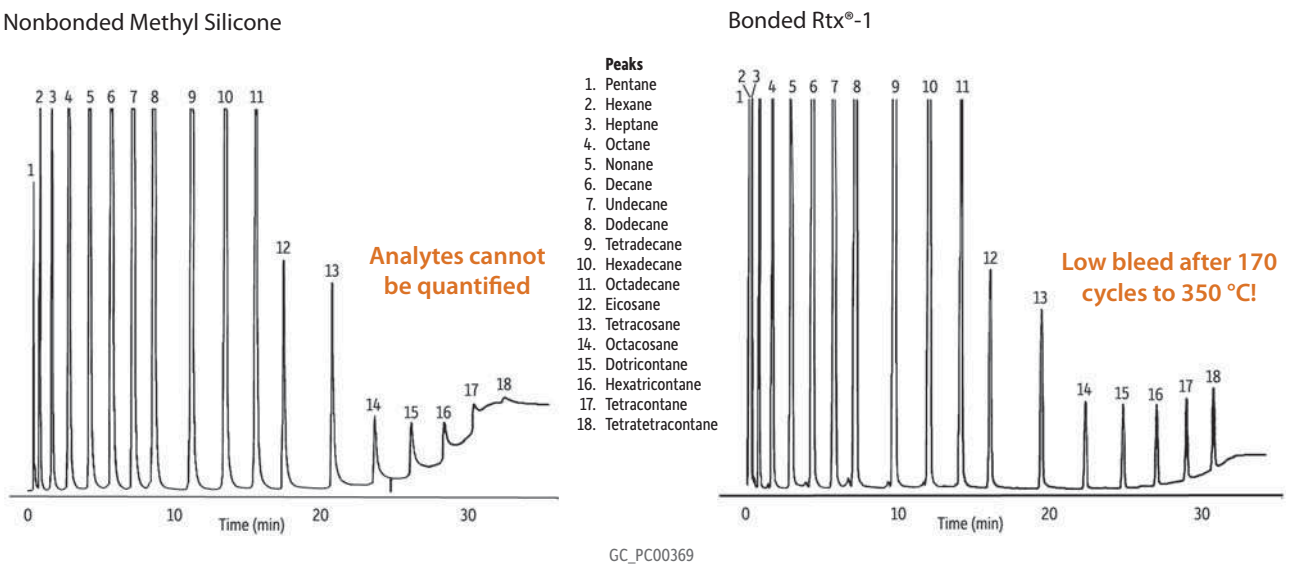
Bonded phases are used in capillary columns because they provide a dramatic increase in column quality. To truly bridge the gap between traditional packed columns and capillary columns, it was necessary to develop bonded liquid phases for packed columns. Packed column chromatographers can expect shorter conditioning times, lower bleed, and longer column lifetimes by using Restek bonded phase packed columns.

Bonded phases also last much longer than nonbonded phases. Bonded phases are more resistant to oxidation than nonbonded phases because of the stronger intermolecular forces produced by cross-linking. Because the material is thoroughly cross-linked, the phase will not migrate or puddle, as often happens with nonbonded phases. Figure 1 shows a comparison of a bonded and a nonbonded methyl silicone column after 170 temperature cycles. The results show the impressive durability of bonded phases.

Equivalent Liquid Phases

Rtx-1	BP-1, CC-1, CP-Sil 5CB, DB-1, DC-200, GE-SF-96, HP-1, HP-101, OV-1, OV-101, RSK-150, RH-1, SE-30, SP-2100, SPB-1, UCC W-98
Rtx-5	BP-5, CB-5, CC-5, CP-Sil 8CB, DB-5, HP-5, OV-73, SE-52, SE-54, SPB-5, Ultra-5
Stabilwax	BP-20, CP-Wax, CW-20, DB-Wax, HP-Innowax, PE-Wax, Supelcowax-10

Figure 1: Bonded packed columns exhibit longer lifetime than nonbonded packed columns.



GC_PC00369

Column	Rtx®-1 Sim Dist 2887, SilcoSmooth® Tubing, 25 inches, 1/8 in. OD, 2 mm ID (cat.# 80000-800)
Sample	1-12% (w/w) each component ASTM D2887-01 calibration mix (1% each listed analyte in CS_2) (cat.# 31674) ASTM D2887-01 calibration mix (5% each, neat) (cat.# 31675)
Injection	
Inj. Vol.:	1.0 µL packed not on-column
Inj. Temp.:	350 °C
Oven	
Oven Temp:	35 °C to 350 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	25 mL/min
Detector	FID @ 350 °C
Notes	FID sensitivity: 256 x 10^{-11} AFS

Packed Column Tubing

Restek offers a wide range of tubing choices for our packed columns, including SilcoSmooth® (Siltek®-treated stainless steel), stainless steel, PTFE, nickel, copper, and Hastelloy® tubing. SilcoSmooth® and stainless steel tubing are our two most popular column materials. SilcoSmooth® tubing is an excellent replacement for fragile glass columns. Stainless steel tubing works well with most applications for nonreactive compounds.

SilcoSmooth® Tubing

If your analysis involves reactive compounds, you can use fragile and inflexible glass columns, or you can step up to SilcoSmooth® tubing, which combines the inertness of glass with the strength and flexibility of stainless steel. Made from ultra-smooth, seamless 304 stainless steel and treated with the innovative Siltek® deactivation process, SilcoSmooth® tubing can replace glass columns for virtually any application.

Stainless Steel Tubing

If you are analyzing hydrocarbons or nonreactive compounds, you can use our rugged, flexible, and economical stainless steel columns. Restek stainless steel columns are made from high-quality weldrawn tubing.

Hastelloy® Tubing

Hastelloy® tubing is a nickel-chromium alloy with excellent inertness. It is normally used only for highly corrosive or oxidizing compounds or gases.

Nickel Tubing

Nickel tubing is often used for analyses of caustic or oxidizing compounds or gases.

Copper Tubing

Copper is a general-purpose tubing that is only recommended for nonactive compounds.

PTFE Tubing

PTFE tubing is often used for reactive compounds or other special applications. Note that this tubing is permeable to gases.

Table I Packed column tubing dimensions

Material	1/4-inch OD x 5.3 mm ID	3/16-inch OD x 3.2 mm ID[1]	1/8-inch OD x 2.0 mm ID[2]	1/8-inch OD x 2.1 mm ID	1/16-inch OD x 1.0 mm ID[3]	0.95 mm OD x 0.75 mm ID[4]	0.74 mm OD x 0.53 mm ID
SilcoSmooth	✓	✓	✓		✓	✓	✓
Stainless Steel	✓	✓		✓	✓	✓	
Hastelloy				✓			
Nickel				✓			
Copper	✓			✓			
PTFE				✓			

[1] 3/16-inch OD x 3.2 mm ID replaces 1/4-inch OD x 4 mm ID glass columns.
[2] 1/8-inch OD x 2.0 mm ID replaces 1/4-inch OD x 2 mm ID glass columns.
[3] 1/16-inch OD x 1.2 mm and 1.0 mm ID micropacked columns are designed for packed column injection systems.
[4] 0.95 mm OD x 0.75 mm ID micropacked columns are designed for capillary injection systems.

please note

We do not offer glass packed columns. SilcoSmooth® columns offer the inertness of glass, without breakage problems.

did you know?

Restek's advanced packed column technology provides columns with unmatched inertness and efficiency.

Packed Column Reduction Fittings

We will weld tubing reducers or VCR fittings to your column. Call Customer Service (ext. 3) or your Restek representative for pricing and availability.

Welded Tubing Reducers

Welded VCR Fittings

Stock Packed Columns

please note

Stock packed columns are designed with a 2" void on the inlet end for on-column injections. For column configurations containing no void, add suffix -901 to the part number.

Bonded Packed Column Stationary Phases

- Low bleed levels.
- Longer column lifetimes.
- Short conditioning times.

	Stainless Steel Tubing				SilcoSmooth Tubing**			
Bonded Phase on 100/120 Silcoport W	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
3% Rtx-1	6	1/8	2.1	80441-	2	1/8	2.0	80401-
10% Rtx-1	6	1/8	2.1	80442-	2	1/8	2.0	80405-
20% Rtx-1	6	1/8	2.1	80443-	2	1/8	2.0	80409-
3% Rtx-5	6	1/8	2.1	80444-	2	1/8	2.0	80477-
10% Rtx-5	6	1/8	2.1	80445-	2	1/8	2.0	80478-
20% Rtx-5	6	1/8	2.1	80446-	2	1/8	2.0	80479-
5% Rtx-Stabilwax	6	1/8	2.1	80447-	2	1/8	2.0	80415-
10% Rtx-Stabilwax	6	1/8	2.1	80448-	2	1/8	2.0	80416-
20% Rtx-Stabilwax	6	1/8	2.1	80449-	2	1/8	2.0	80417-
Rtx-1 SimDist 2887***	25"	1/8	2.1	80450-	25"	1/8	2.0	80000-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
**Siltek-treated stainless steel.
***Application specific column.

Chromosorb® Diatomaceous Earth Supports

	Stainless Steel Tubing				SilcoSmooth Tubing**			
On 100/120 Silcoport W* **	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
3% Rt-101	6	1/8	2.1	80461-	2	1/8	2.0	80400-
3% Rt-2100	6	1/8	2.1	80462-	2	1/8	2.0	80420-
5% Rt-1200/1.75% Bentone 34	6	1/8	2.1	80463-	2	1/8	2.0	80125-
5% Rt-1200/5% Bentone 34	6	1/8	2.1	80464-	2	1/8	2.0	80129-

		Stainless Steel Tubing				SilcoSmooth Tubing**			
On Chromosorb PAW	**Mesh**	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
10% TCEP	100/120	8	1/8	2.1	80465-	2.5	1/8	2.0	80126-
23% Rt-1700	80/100	30	1/8	2.1	80466-	9.2	1/8	2.0	80128-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
**Siltek-treated stainless steel.
***Modified version of Chromosorb W; highest inertness, most consistent performance.

please note

Temperature limits for stationary phases are listed on **page 130**.

Porous Polymer Packed Columns

Restek offers a full range of porous polymers, including HayeSep®, Porapak, and Chromosorb® Century Series polymer packings for analyses of volatile components and light solvents. Our QA procedures give you the confidence that every batch you purchase will deliver consistent column-to-column performance.

	Stainless Steel Tubing				SilcoSmooth Tubing**			
Porous Polymers 80/100 Mesh	**L (ft)**	**OD (in)**	**ID (mm)**	**cat.#***	**L (m)**	**OD (in)**	**ID (mm)**	**cat.#***
HayeSep Q	6	1/8	2.1	80467-	2	1/8	2.0	80433-
Porapak Q	6	1/8	2.1	80468-	2	1/8	2.0	80427-
Porapak QS	6	1/8	2.1	80469-	2	1/8	2.0	80426-
Porapak R	6	1/8	2.1	80470-	2	1/8	2.0	80425-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.
**Siltek-treated stainless steel.

also available

Chromosorb®, Porapak, HayeSep®, and Tenax® packing materials.
See **page 129.**

CarboBlack Solid Supports

Graphitized carbon black offers unique selectivity and very little adsorption for alcohol analyses. Two types of CarboBlack supports are available, CarboBlack B and CarboBlack C. CarboBlack B support, with its higher surface area, can hold up to a 10% loading of a nonsilicone liquid phase. CarboBlack C support can hold up to a 1% loading of a nonsilicone liquid phase. Many Carbowax® 20M-loaded CarboBlack packings are available. CarboBlack packings are treated with KOH or picric acid for basic or acidic compounds, and special alcoholic beverage loadings are available. CarboBlack supports provide resolution and retention similar to Carbopack™ and Carbograph supports.

		Stainless Steel Tubing					SilcoSmooth Tubing**			
On CarboBlack B	Mesh	L (ft)	OD (in)	ID (mm)	cat.#*		L (m)	OD (in)	ID (mm)	cat.#*
5% Carbowax 20M	80/120	—	—	—	—	—	2	1/8	2.0	80105-
5% Carbowax 20M	60/80	6	1/8	2.1	88012-		1.8	1/8	2.0	80106-
6.6% Carbowax 20M	80/120	6	1/8	2.1	80451-		2	1/8	2.0	80107-
4% Carbowax 20M/ 0.8% KOH	60/80	—	—	—	—	—	2	1/8	2.0	80116-
1% Rt-1000	60/80	8	1/8	2.1	88013-		2.4	1/8	2.0	80206-
1% Rt-1000	60/80	6	1/8	2.1	80452-		2	1/8	2.0	80207-
3% Rt-1500	80/120	10	1/8	2.1	80453-		3.05	1/8	2.0	80211-
1% Rt-1510	60/80	10	1/8	2.1	80454-		3.05	1/8	2.0	80216-
1.5% XE-60/1% H_3PO_4	60/80	6	1/8	2.1	80455-		1.8	1/8	2.0	80305-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
**Siltek-treated stainless steel.

		Nickel 200 Tubing			
On CarboBlack B	Mesh	L (m)	OD (in)	ID (mm)	cat.#*
5% Krytox (Ni 200 tubing)	60/80	3.05	1/8	2.1	80127-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

		Stainless Steel Tubing					SilcoSmooth Tubing**			
On CarboBlack C	Mesh	L (ft)	OD (in)	ID (mm)	cat.#*		L (m)	OD (in)	ID (mm)	cat.#*
0.2% Carbowax 1500	60/80	6	1/8	2.1	80456-		2	1/8	2.0	80121-
0.2% Carbowax 1500	80/100	6	1/8	2.1	80457-		2	1/8	2.0	80122-
0.1% Rt-1000	80/100	6	1/8	2.1	80458-		1.8	1/8	2.0	80205-
0.19% picric acid	80/100	6	1/8	2.1	80459-		2	1/8	2.0	80311-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

Molecular Sieve Packed Columns

Molecular sieve packed columns easily separate permanent gases at above-ambient temperatures. Restek's R&D chemists have developed a process for preparing molecular sieve packings, which result in excellent batch-to-batch reproducibility. In addition, our molecular sieves are preactivated and ready to use. Each column comes with metal end-fittings to prevent water or carbon dioxide from adsorbing into the packing during shipment.

		Stainless Steel Tubing					SilcoSmooth Tubing**			
Molecular Sieve	Mesh	L (ft)	OD (in)	ID (mm)	cat.#*		L (m)	OD (in)	ID (mm)	cat.#*
Molesieve 5A	60/80	6	1/8	2.1	80473-		2	1/8	2.0	80428-
Molesieve 5A	80/100	3	1/8	2.1	88015-		1	1/8	2.0	80440-
Molesieve 5A	80/100	6	1/8	2.1	80474-		2	1/8	2.0	80429-
Molesieve 5A	80/100	10	1/8	2.1	88014-		3.05	1/8	2.0	80430-
Molesieve 13X	60/80	6	1/8	2.1	80475-		2	1/8	2.0	80480-
Molesieve 13X	80/100	6	1/8	2.1	80476-		2	1/8	2.0	80439-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
**Siltek-treated stainless steel.

also available

CarboBlack packing materials. See **page 127**.

Column Instrument Configurations


General Configuration
Suffix -800


Agilent 5880, 5890, 5987, 6890, 7890:
Suffix -810*


Bruker 430, 3700, Vista Series, FID:
Suffix -820

PE 900-3920, Sigma 1,2,3:
Suffix -830

PE Auto System 8300, 8400, 8700
Suffix -840

See page 135 for additional configurations.

Note: Initial 2" of column will be empty to accommodate a needle. For a completely filled column (not on-column) add suffix -901.
*-810 suffix also includes 1 1/2" void on detector side.

Custom
Packed/Micropacked Column Request Form

See **page 134** or visit
www.restek.com/**packed**

Stock Micropacked Columns

Made with INERT SilcoSmooth® tubing!

All micropacked columns are made with inert SilcoSmooth® tubing, which is Siltek® treated for maximum inertness. See **page 117.**

Micropacked GC Columns

- Increased efficiency over traditional packed columns.
- Higher capacity than PLOT columns.
- Made from inert, flexible Siltek®-treated stainless steel tubing.
- Siltek®-treated, braided-wire end plug keeps packing intact, even under intense pressure surges during valve switching.
- Wide range of packings available.

Efficient, Inert, and Flexible

Micropacked columns are highly efficient and provide good sample capacity. With inert Siltek® treatment, micropacked columns are a powerful tool for solving many difficult application problems. The unsurpassed inertness of SilcoSmooth® tubing is based on Siltek® deactivation, which allows the column to be flexed and coiled without any fear of chipping or cracking the inert surface.

Easy to Install—Multiple Internal Diameters

Our micropacked columns are designed to fit packed and capillary injection systems. Standard wall ($^1/_{16}$-inch OD) micropacked columns offer improved efficiency in packed column instruments without the expense of converting to capillary injection systems. Smaller OD (0.95 mm OD) micropacked columns install easily into a capillary injector, using slightly larger ferrules. Micropacked columns operate at flows exceeding 10 cc/min for trouble-free operation.

Braided Wire End Plugs

Glass wool end plugs can be dislodged easily by carrier gas pressure surges. Restek's chemists insert braided wire into the column and secure it by making a small crimp near the column outlet. End plugs are Siltek® treated—the sample contacts only inert surfaces.

Micropacked GC Columns (0.53 mm ID)

- Available with a variety of packing materials.
- High capacity and retention for volatile compounds.
- Can be coiled to fit any GC.

	Mesh	ID	OD	Temp. Range	1-Meter	2-Meter
HayeSep Q	80/100	0.53 mm	0.74 mm	up to 275 °C		19042
Molesieve 5A	80/100	0.53 mm	0.74 mm	up to 300 °C		19041
Rt-XLSulfur	100/120	0.53 mm	0.74 mm	up to 300 °C		19044
ShinCarbon ST	80/100	0.53 mm	0.74 mm	up to 330 °C	19045	19043

Micropacked GC Columns (0.75 mm ID)

	ID	OD	Temp. Range	0.56-Meter
20% TCEP on 80/100 Chromosorb PAW	0.75 mm	$^1/_{16}$"	0–175 °C	19040

	Mesh	ID	OD	Temp. Range	1-Meter	2-Meter
HayeSep R	100/120	0.75 mm	0.95 mm	up to 250 °C	19014	19015
HayeSep Q	100/120	0.75 mm	0.95 mm	up to 275 °C	19018	19019
HayeSep N	100/120	0.75 mm	0.95 mm	up to 165 °C	19022	19023
HayeSep S	100/120	0.75 mm	0.95 mm	up to 250 °C	19010	19011
Molesieve 5A	80/100	0.75 mm	0.95 mm	up to 300 °C	19002	19003
Molesieve 13X	80/100	0.75 mm	0.95 mm	up to 350 °C	19006	19007

Micropacked GC Columns (1.00 mm ID)

	Mesh	ID	OD	Temp. Range	1-Meter	2-Meter
HayeSep R	100/120	1.00 mm	$^1/_{16}$"	up to 250 °C	19012	19013
HayeSep Q	100/120	1.00 mm	$^1/_{16}$"	up to 275 °C	19016	19017
HayeSep N	100/120	1.00 mm	$^1/_{16}$"	up to 165 °C	19020	19021
HayeSep S	100/120	1.00 mm	$^1/_{16}$"	up to 250 °C	19008	19009
Molesieve 5A	80/100	1.00 mm	$^1/_{16}$"	up to 300 °C	19000	19001
Molesieve 13X	80/100	1.00 mm	$^1/_{16}$"	up to 350 °C	19004	19005

Custom

Packed/Micropacked Column Request Form

See **page 134** or visit

www.restek.com/**packed**

Aromatics Analysis

D3606 Application Column (2 column set)

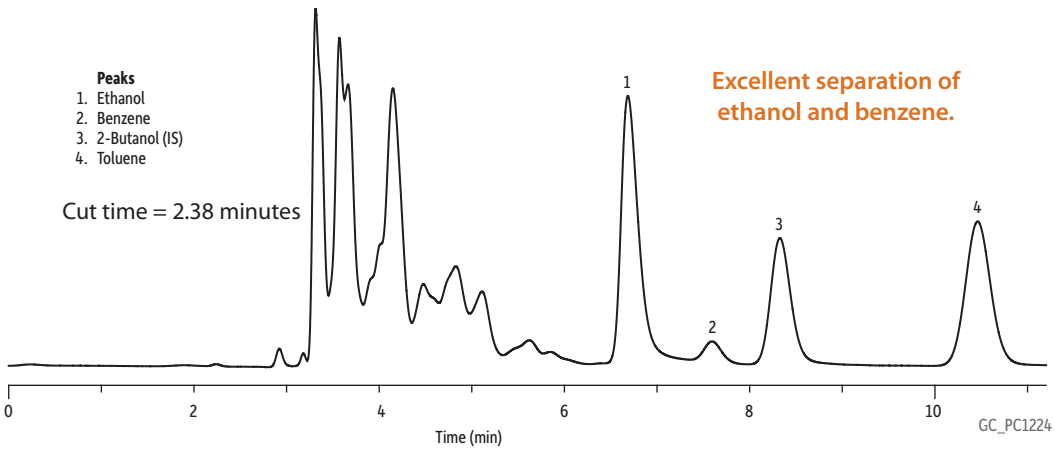
- Complete separation of ethanol and benzene with a resolution value > 3.00.
- Accurate quantification of benzene and toluene.
- Fully conditioned two-column set—ready to use out of the box.
- Listed in the appendix of ASTM Method D3606 as an acceptable alternative to TCEP columns—get better separation of benzene and ethanol while still following ASTM method requirements.

Conforms to the specifications established in ASTM method D3606-10 for the quantitation of benzene and toluene in spark ignition fuel containing ethanol.

Description	cat.#*
D3606 Application Column (2 column set)**	
Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx-1	83606-
Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material	

*Please add column instrument configuration suffix number to cat.# when ordering. See page 119.
**The column set is designed to accommodate both valve injection and/or syringe injection. Column 1 is configured with a 2" inlet void to facilitate on-column injection. The inlet is identified on both column 1 and column 2. Note: The inlet of column 2 is identified for proper orientation for connection to the valve.

Gasoline Containing Ethanol on D3606 Application Column Set by ASTM D3606-10 (Modified)



Column	D3606 application column (2 column set). Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx®-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material (cat.# 83606-800)
Sample	Ethanol-containing gasoline with internal standard (IS)
Diluent:	
Injection	Sample valve
Sample Loop Vol.:	1.5 µL
Valve Temp.:	150 °C
Oven	
Oven Temp:	135 °C (hold 12 min)
Carrier Gas	He, constant flow
Flow Rate:	20.0 mL/min
Detector	TCD @ 200 °C
Notes	2.38 minute backflush (must be determined for each GC system).

Light Hydrocarbon Analysis

Special Columns for Unsaturated Light Hydrocarbons

- Faster separations of C1 to C4 hydrocarbons.
- Res-Sil® packing replaces Porasil materials.

n-Octane on Res-Sil® C Packed Column

This packed column has unique selectivity for resolving unsaturated light hydrocarbons (Figure 1).

OPN on Res-Sil® C Packed Column

This column separates the light hydrocarbons, and baseline resolves *cis*-2-butene from 1,3-butadiene (Figure 2).

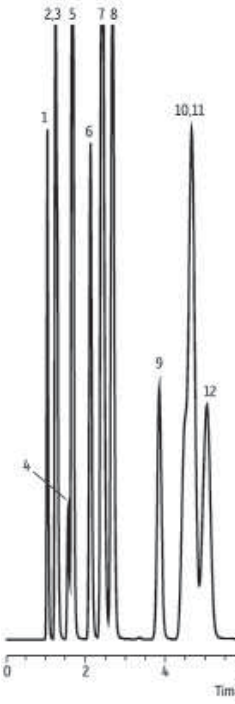
2abc Refinery Gas Column Set

This three-column set is finely tuned to resolve light hydrocarbons. When used in the proper valving system, it will elute C5+ hydrocarbons ahead of C1 through C4 hydrocarbons (Figure 3).

Description	cat.#*
n-Octane on Res-Sil C, 80/100 (20', 2.0 mm ID, 1/8" Silcosmooth OD)	80436-
OPN on Res-Sil C, 80/100 (12', 2.0 mm ID, 1/8" Silcosmooth OD)	80437-
2abc Refinery Gas Column Set (3 column set)**	88000-
2.1% Carbowax 1540 Porasil C (backflush column)***	88004-875

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.
**This column set is for a valving system; therefore, packing material is filled to ends of columns.
***To be used with 2abc refinery gas column set (cat.# 88000-) to backflush and prevent C6+ hydrocarbons from entering column set.

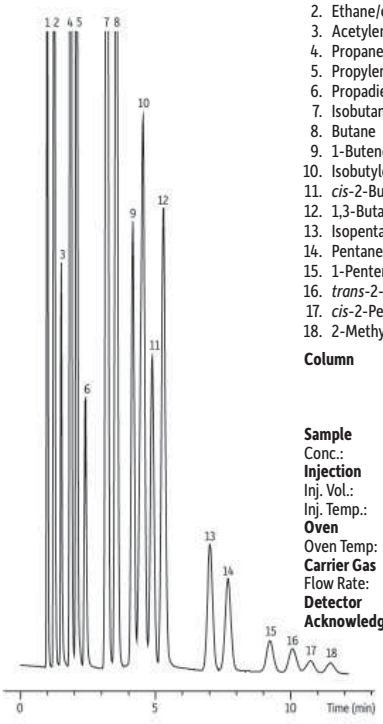
Figure 1: *n*-Octane on Res-Sil® C packing demonstrates unique selectivity for unsaturated light hydrocarbons.



Peaks	
1. Methane	9. 1-Butene
2. Ethane	10. Pentane
3. Ethylene	11. Isobutylene
4. Acetylene	12. 1,3-Butadiene
5. Propane	13. 1-Pentene
6. Propylene	14. *trans*-2-Pentene
7. Isobutane	15. *cis*-2-Pentene
8. *n*-Butane	16. 2-methylbutene-2

Column	*n*-octane, SilcoSmooth® tubing, 80/100 mesh on Res-Sil® C, 20 ft, 1/8 in. OD, 2 mm ID (cat.# 80436-800)
Sample	Refinery gas C1-C5
Injection	
Inj. Vol.:	20 µL packed not on-column
Inj. Temp.:	150 °C
Oven	
Oven Temp:	60 °C
Carrier Gas	He, constant flow
Flow Rate:	30 mL/min
Detector	FID @ 150 °C

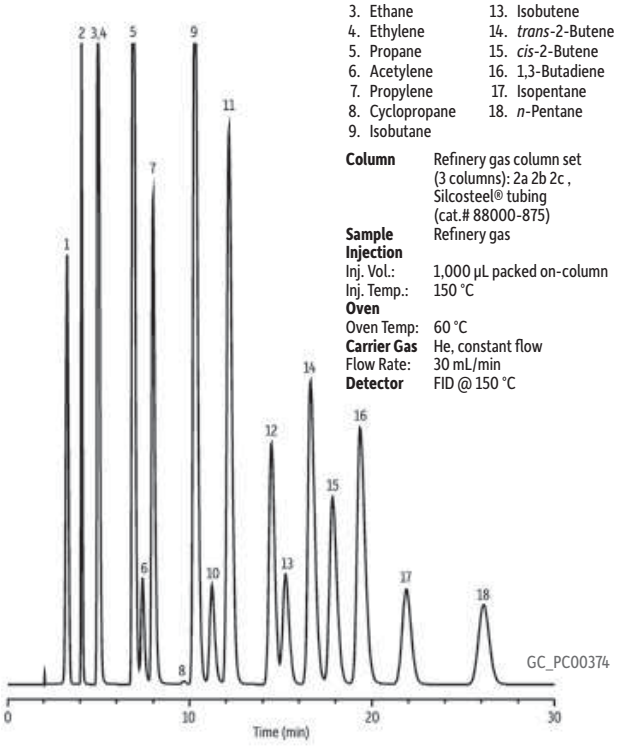
Figure 2: OPN on Res-Sil® C packing demonstrates unique selectivity for *cis*-2-butene and 1,3-butadiene.



Peaks	Retention Indices
1. Methane	100
2. Ethane/ethylene	200
3. Acetylene	260
4. Propane	300
5. Propylene	321
6. Propadiene	345
7. Isobutane	386
8. Butane	400
9. 1-Butene	422
10. Isobutylene/*trans*-2-butene	434
11. *cis*-2-Butene	443
12. 1,3-Butadiene	454
13. Isopentane	488
14. Pentane/3-methyl-1-butene	503
15. 1-Pentene	522
16. *trans*-2-Pentene	533
17. *cis*-2-Pentene	540
18. 2-Methyl-2-butene	549

Column	OPN, SilcoSmooth® Tubing, 80/100 mesh on Res-Sil® C packing, 12 ft, 1/8 in. OD, 2 mm ID (cat.# 80437-800)
Sample	Refinery gas
Conc.:	0.1-6 absolute mole %
Injection	
Inj. Vol.:	20 µL packed on-column
Inj. Temp.:	200 °C
Oven	
Oven Temp:	50 °C
Carrier Gas	He, constant flow
Flow Rate:	30 mL/min
Detector	FID @ 200 °C
Acknowledgement	Standard courtesy of AC Analytical Controls

Figure 3: Refinery gas calibration standard on refinery gas packed column set.



Peaks	
1. C5-C6+	10. Propadiene
2. Methane	11. *n*-Butane
3. Ethane	12. 1-Butene
4. Ethylene	13. Isobutene
5. Propane	14. *trans*-2-Butene
6. Acetylene	15. *cis*-2-Butene
7. Propylene	16. 1,3-Butadiene
8. Cyclopropane	17. Isopentane
9. Isobutane	18. *n*-Pentane

Column	Refinery gas column set (3 columns): 2a 2b 2c , Silcosteel® tubing (cat.# 88000-875)
Sample	Refinery gas
Injection	
Inj. Vol.:	1,000 µL packed on-column
Inj. Temp.:	150 °C
Oven	
Oven Temp:	60 °C
Carrier Gas	He, constant flow
Flow Rate:	30 mL/min
Detector	FID @ 150 °C

for more info

See **page 128** for more information on Res-Sil® packing materials.

Permanent Gases & Hydrocarbon Analysis

ShinCarbon ST Packed/Micropacked Columns

- Separate permanent gases, including CO/CO_2, without cryogenic cooling.
- Rapid separations of permanent gas/light hydrocarbon mixtures.
- Excellent compatibility with most GC detectors—minimal bleed, minimal baseline rise.
- Preconditioned, less than 30 minutes to stabilize.
- Maximum temperature of 280 °C/300 °C.

Analyze oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide with one column and at room temperature. ShinCarbon ST material, a high surface area carbon molecular sieve (~1,500 m^2/g), is the ideal medium for separating gases and highly volatile compounds by gas solid chromatography (GSC). The rapid, above-ambient analyses these columns provide will be a great convenience. Excellent thermal stability of the high surface area carbon, combined with careful conditioning during column manufacturing, ensures low-bleed operation and rapid stabilization when installing a new column. Custom-made ShinCarbon ST columns are available on request.

ShinCarbon ST is a highly stable material. Its 300 °C upper programmed temperature limit minimizes bleed and baseline rise during temperature programming, making the material compatible with most detection systems used for gas analysis, including TCD or HID. All ShinCarbon ST columns are fully conditioned in an oxygen/moisture free environment to prevent contamination. This minimizes stabilization time (less than 30 minutes) when installing a new column which, in turn, reduces downtime.

ShinCarbon ST Columns (packed)
(SilcoSmooth® Stainless Steel)*

OD	ID	Mesh	2-Meter
1/8" Silcosmooth	2.0 mm	80/100	80486-

*Please add column instrument configuration suffix number to cat.# when ordering. See chart on the next page.

ShinCarbon ST Columns (micropacked)
(SilcoSmooth® Stainless Steel)**

OD	ID	Mesh	1-Meter	2-Meter
1/16"	1.0 mm	100/120	19809	19808
0.95 mm	0.75 mm	100/120	19810	
0.74 mm	0.53 mm	80/100	19045	19043

**Does not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 125.

it's a fact

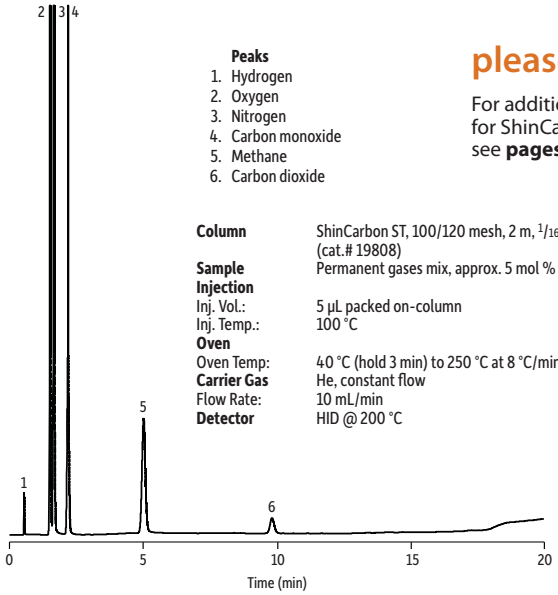
ShinCarbon ST is an ideal packing material for permanent gases, low molecular weight hydrocarbons, sulfur dioxide, and Freon® gases.

also available

For adapter kits for installing packed/micropacked columns, see **page 125.**

19808

Permanent Gases on ShinCarbon ST



Peaks
1. Hydrogen
2. Oxygen
3. Nitrogen
4. Carbon monoxide
5. Methane
6. Carbon dioxide

Column	ShinCarbon ST, 100/120 mesh, 2 m, 1/16 in. OD, 1.0 mm ID (cat.# 19808)
Sample	Permanent gases mix, approx. 5 mol % each
Injection	
Inj. Vol.:	5 µL packed on-column
Inj. Temp.:	100 °C
Oven	
Oven Temp:	40 °C (hold 3 min) to 250 °C at 8 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	HID @ 200 °C

GC_PC00666

please note

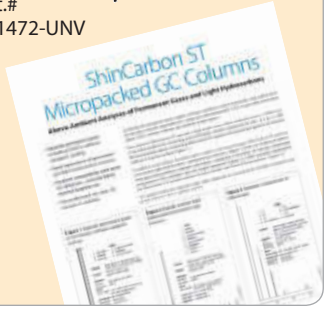
For additional chromatograms for ShinCarbon ST columns, see **pages 659 and 677**.

free literature

ShinCarbon ST
Micropacked GC Columns
Above-Ambient Analyses of Permanent Gases and Light Hydrocarbons

Download your free copy from
www.restek.com

lit. cat.#
PCTS1472-UNV



did you know?

Rt®-XLSulfur columns are optimized for low ppb-level sulfur analysis!

also available

For adapter kits for installing packed/micropacked columns, see **page 125**.

free literature

Rt®-XLSulfur Packed Column
Specialized packed and micropacked columns for eXtra-Low Sulfur analysis

Download your free copy from
www.restek.com

lit. cat.#
PCTS1500-UNV

Column Instrument Configurations


General Configuration
Suffix -800


Agilent 5880, 5890, 5987, 6890, 7890:
Suffix -810*


Bruker 430, 3700, Vista Series, FID:
Suffix -820

PE 900-3920, Sigma 1,2,3:
Suffix -830

PE Auto System 8300, 8400, 8700
Suffix -840

See page 135 for additional configurations.

Note: Initial 2" of column will be empty to accommodate a needle. For a completely filled column (not on-column) add suffix -901.
*-810 suffix also includes 1 1/2" void on detector side.

Sulfur Analysis

Rt®-XLSulfur Packed/Micropacked Columns

- Optimized columns for low ppbv sulfur analyses.
- Eliminate the need for PTFE tubing.
- Column and end fittings are Sulfinert® treated for maximum inertness.
- Maximum temperature of 290 °C.

Sulfur analyses are traditionally performed using PTFE tubing to improve column inertness. Unfortunately, PTFE tubing is gas permeable, difficult to pack with high efficiency, prone to shrinkage, and has poor thermal stability. The Rt®-XLSulfur packed or micropacked column eliminates these problems. The packing material for Rt®-XLSulfur columns is extensively deactivated for analysis of low ppbv levels of hydrogen sulfide and methyl mercaptan. It is then treated to achieve effective separation of hydrocarbons from sulfur compounds. The interior wall and the end fittings of the Rt®-XLSulfur column are Siltek® treated, making the column as inert as PTFE. The extra care taken to manufacture this column ensures more accurate analyses of sulfur compounds.

Rt®-XLSulfur Columns (packed)*

OD	ID	Mesh	1-Meter	2-Meter
1/8"	2.0 mm	100/120	80484-	80485-
3/16"	3.2 mm	100/120	80482-	80483-

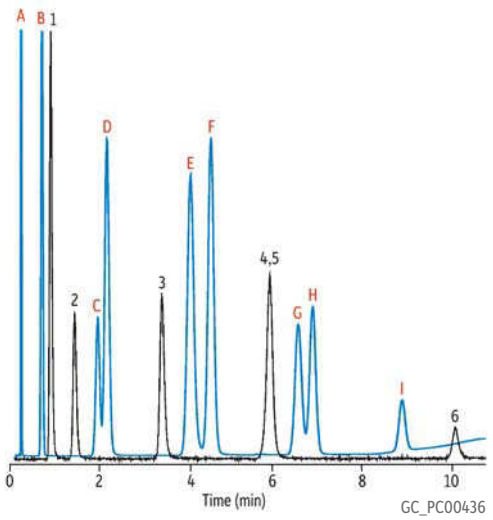
*Please add column instrument configuration suffix number to cat.# when ordering. See chart on this page.

Rt®-XLSulfur Columns (micropacked)**

OD	ID	Mesh	1-Meter	2-Meter
1/16"	1.0 mm	100/120	19804	19805
0.95 mm	0.75 mm	100/120	19806	19807
0.74 mm	0.53 mm	100/120		19044

**Does not include column nuts and ferrules. Optional installation kits can be ordered separately—see page 125.

Sulfur Compounds and Hydrocarbons on Rt®-XLSulfur



Sulfurs
1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Dimethyl disulfide

Hydrocarbons
A. Methane
B. Ethane
C. Propylene
D. Propane
E. Isobutane
F. Butane
G. Isopentane
H. Pentane
I. Hexane

Column	Rt®-XLSulfur, 1 m, 0.95 mm OD, 0.75 mm ID (cat.# 19806)
Sample	
Conc.:	50 ppb each
Injection	packed not on-column
Oven	
Oven Temp:	60 °C to 230 °C at 15 °C/min
Carrier Gas	He, constant flow
Flow Rate:	9 mL/min
Detector	SCD/FID
Acknowledgement	Sulfur standards courtesy of DCG Partnership 1 Ltd., Pearland, TX.

Packed/Micropacked Column Installation Kits

Packed Column Inlet Adaptor Kits

- Use 1/8" and 3/16" OD columns in 1/4" on-column injection ports.
- Centers column perfectly in injection port to eliminate bent syringe needles.
- Slotted design prevents carrier gas occlusion.
- Vespel®/graphite reducing ferrules make installation easy.
- Includes all nuts and ferrules used to attach tubing to the injector or detector.

Adaptor kit centers the packed column in the injection port, so the syringe will not scrape the sides of the column.

Description	For 1/8" Columns qty.	cat.#	For 3/16" Columns qty.	cat.#
Packed Column Inlet Adaptor Kit for 1/4" Injection Ports	kit	21651	kit	21650

Installation Kits for Micropacked Columns

Description	qty.	cat.#
Micropacked Column Installation Kit for 1 mm ID columns; for valve applications. Kit contains: 1/16" Valco nut (1), 1/16" stainless steel nut (1), 1/16" Vespel/graphite ferrule (1), 1/16" graphite ferrule (1), stainless steel ferrule (1), 1/16" stainless steel front ferrule (1), 1/16" stainless steel back ferrule (1).	kit	21065
Micropacked Column Installation Kit for 1 mm ID columns; for direct injections. Kit contains: 1/16" stainless steel nuts (2), 1/16" Vespel/graphite ferrules (2), 1/16" graphite ferrules (2), 1/16" stainless steel front ferrules (2), 1/16" stainless steel back ferrules (2).	kit	21066

21065

Installation Kit for Packed Columns

Description	qty.	cat.#
Packed Column Installation Kit for 2 mm ID columns; for valve applications. Kit contains: 1/8" stainless steel nut (1), stainless steel Valco nut (1), 1/8" Vespel/graphite ferrule (1), stainless steel Valco ferrule (1), 1/8" stainless steel front ferrule (1), 1/8" stainless steel back ferrule (1).	kit	21067

21067

Micropacked Inlet Conversion Kits

- Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.
- For use with Agilent 5890, 6890, and 7890 GCs.
- Sample pathways deactivated for ultimate inertness.

Description	qty.	cat.#
Micropacked Column Adaptor Kit for Split/Splitless Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4 mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424
Micropacked Column Adaptor Kit for On-Column Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425
Micropacked Column Adaptor Kit for Split/Splitless Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4 mm splitless liner, intermediate polarity deactivated	kit	22426
Micropacked Column Adaptor Kit for On-Column Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427
Micropacked Column Adaptor Kit for FID* *FID Adaptor Kit* Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428
Replacement Inlet Seals for Micropacked Column Adaptor Dual Vespel ring inlet seals, large bore (2)	2-pk.	22429
Replacement Metal Liner Installation Guide for On-Column Injection, Siltek Treated	ea.	22430
Replacement 4 mm Splitless Liner	ea.	20772

*For use with packed column FIDs only.

Large-Bore Dual Vespel® Ring Inlet Seals

1/4" SS Nut

Large-Bore FID Adaptor

1/4" Vespel®/Graphite Ferrule

1/16" SS Nuts

Large-Bore Reducing Nut

1/16" Vespel®/ Graphite Ferrules

22430

20772

restek innovation!

Most **INERT** solid support available!

Silcoport® Packing Materials

Outperform Any Deactivated Diatomaceous Earth Supports Available!

- Superior deactivation technology for improved inertness.
- Available in 80/100 and 100/120 mesh.
- Uniform particle distribution for maximum efficiency.

The increased sensitivity of modern detection systems and the desire to reduce detection limits require a solid support to meet the challenging demands faced by analysts. Unlike conventional dimethyldichlorosilane (DMDCS) deactivation, Silcoport® incorporates our proprietary fused silica deactivation technology on diatomaceous earth solid supports. Silcoport® supports were developed using a special mixture of deactivants that yields the highest inertness without changing the polarity of the stationary phase. Silcoport® supports from Restek are the perfect match for highly inert SilcoSmooth® tubing.

Description	Temp. Limit	Mesh	Min. Qty.†	cat.#
Silcoport P*	400 °C	80/100	100 g	25641
	400 °C	100/120	100 g	25642

Please call for availability.

*Prepared from Chromosorb P; Restek acid washed deactivation.
†Bulk quantities are available.

did you know?

Silcoport support replaces

- Supelcoport
- Chromosorb® W HP
- GasChrom Q 2

please note

Silcoport® is available uncoated or coated with the liquid stationary phase of your choice on 80/100 or 100/120 mesh sizes. Call Restek at 800-356-1688 or 814-353-1300, ext. 3, or contact your Restek representative for pricing and availability.

Custom
Packed/Micropacked Column Request Form

See **page 134** or visit www.restek.com/**packed**

CarboBlack Packing Materials

- CarboBlack B supports up to 10% loading of a nonsilicone liquid phase.
- CarboBlack C supports up to 1% loading of a nonsilicone liquid phase.
- Equivalent to Supelco's Carbopack™ packings.

Graphitized carbon black offers unique selectivity and very little adsorption for alcohol analyses. Two types of CarboBlack supports are available, CarboBlack B and CarboBlack C. CarboBlack B support, with its higher surface area, can hold up to a 10% loading of a nonsilicone liquid phase. CarboBlack C support can hold up to a 1% loading of a nonsilicone liquid phase. Many Carbowax® 20M-loaded CarboBlack packings are available. CarboBlack packings are treated with KOH or picric acid for basic or acidic compounds, and special alcoholic beverage loadings are available. CarboBlack supports provide resolution and retention similar to Carbopack™ and Carbograph supports.

did you know?

CarboBlack supports replace
- Carbopack™
- Carbograph

Description	Temp. Limit	Mesh	Min. Qty.	cat.#
CarboBlack B	500 °C	60/80	10 g	25500
	500 °C	80/120	10 g	25501
CarboBlack C	500 °C	60/80	10 g	25502
	500 °C	80/100	10 g	25503
CarboBlack BHT-100	150 °C	40/60	10 g	25504
CarboBlack III (F)	175 °C	80/100	10 g	25506
5% Carbowax 20m on CarboBlack B	225 °C	80/120	10 g	25507
6.6% Carbowax 20m on CarboBlack B	225 °C	80/120	10 g	25508
4% Carbowax 20m / 0.8% KOH on CarboBlack B	220 °C	60/80	10 g	25509
0.19% picric acid on CarboBlack C	120 °C	80/100	10 g	25510
4% Carbowax 20m on CarboBlack B-DA	200 °C	80/120	10 g	25511

Minimum order of 10 grams. Price is per gram.

Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you with everything from setup to method development.

Contact us:

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.: Phone: 1-800-356-1688, ext. 4 • Fax: 1-814-353-1568 • e-mail: support@restek.com

Hours of operation (Eastern Time):
Monday - Thursday, 8:00 a.m. to 6:00 p.m.
Friday, 8:00 a.m. to 5:00 p.m.

Outside the U.S.? *Contact your Restek representative.*

Packed Column Packing Materials

also available

Custom packing materials are also available. See **page 132**.

did you know?

Res-Sil® replaces
- Porasil B
- Porasil C

Custom Packed/Micropacked Column Request Form

See **page 134** or visit www.restek.com/**packed**

Res-Sil® Packing Materials

- Unique separation of saturated and unsaturated hydrocarbons.
- Innovative bonding chemistry for batch-to-batch reproducibility, excellent thermal stability, and long life.
- Wide range of bonded phases available.
- Equivalent to Waters Durapak packings.

Bonded silica packings with *n*-octane or cyanopropyl (OPN) functional groups yield faster separations of C1 to C4 hydrocarbons, higher thermal stability, shorter conditioning times, and longer lifetimes than conventional packings. However, bonded silica packings have had inconsistent reproducibility and limited availability. Restek's research team has solved these age-old problems by developing Res-Sil® C packings for consistent performance.

Unique Selectivity for Process GC and High-Speed Analysis of Petrochemicals

Res-Sil® C bonded packings are ideal for fast resolution of difficult-to-separate saturated and unsaturated C4 hydrocarbons (see page122). This unique selectivity, when combined with other columns in series, provides petroleum and petrochemical method developers with a powerful tool for fast determination of C1 to C5 hydrocarbons.[1]

Innovative Research and Stringent QA Provide Batch-to-Batch Consistency

Restek's synthesis procedure eliminates batch-to-batch variations. The amount of bonded liquid phase is precisely controlled in every batch for reproducible retention times and separations. Each production batch of Res-Sil® C packing is tested with a complex hydrocarbon mixture to meet demanding retention time and retention index specifications and to ensure there are no retention shifts. Column bleed is also evaluated to ensure that baselines remain low.

OPN on Res-Sil® C Packing—the Latest in a Line of Bonded GC Phases

Restek offers a wide range of bonded packings for packed column GC, including Rtx®-1, Stabilwax®, and Carbowax® phases. We have extended this technology to make *n*-octane on Res-Sil® C packing, and OPN on Res-Sil® C packing. Each of these packings has low bleed, conditioning times of less than 30 minutes, long lifetime, and consistent batch-to-batch reproducibility.

Description	Temp. Limit	Mesh	Min. Qty.	cat.#
Res-Sil C	300 °C	60/80	10 g	25400
	300 °C	80/100	10 g	25028
Res-Sil B	300 °C	60/80	10 g	25401
	300 °C	80/100	10 g	25080
1% TCEP on Res-Sil B	175 °C	80/100	10 g	25081
OPN on Res-Sil C	150 °C	80/100	10 g	25042
n-Octane on Res-Sil C	150 °C	80/100	10 g	25030
2% Carbowax 1540 on Res-Sil C	150 °C	80/100	10 g	25044

Minimum order of 10 grams. Price is per gram.

[1]N.C. Saha, S.K. Jain, and R.K. Dua. J. Chromat. Sci 1978, 323-328.

Chromosorb® Century Packings

Description	Temp. Limits	g/btl.	Mesh 60/80 cat.#	Mesh 80/100 cat.#	Mesh 100/120 cat.#
Chromosorb 101	275/325 °C	50 g	25608	25609	25610
Chromosorb 102	250/300 °C	50 g	25611	25612	25613
Chromosorb 103	275/300 °C	50 g	25614	25615	25616
Chromosorb 104	(equivalent to HayeSep C)				
Chromosorb 106	250/275 °C	50 g	25620	25621	25622
Chromosorb 107	250/275 °C	50 g	25623	25624	25625
Chromosorb 108	250/275 °C	50 g	25626	25627	25628

Please call for availability.

Porapak Series Packings

Description	Temp. Limit	g/btl.	Mesh 50/80 cat.#	Mesh 80/100 cat.#	Mesh 100/120 cat.#
Porapak P	250 °C	20 g	25576	25577	25578
Porapak PS	250 °C	20 g	25579	25580	25581
Porapak Q	250 °C	26 g	25582	25583	25584
Porapak QS	250 °C	26 g	25585	25586	25587
Porapak R	250 °C	24 g	25588	25589	25590
Porapak S	250 °C	26 g	25591	25592	25593
Porapak N	190 °C	29 g	25594	25595	25596
Porapak T	190 °C	31 g	25597	25598	25599

HayeSep® Series Packings

Description	Temp. Limit	g/btl.	Mesh 60/80 cat.#	Mesh 80/100 cat.#	Mesh 100/120 cat.#
HayeSep A	165 °C	24 g	22560	25032	25033
HayeSep B	190 °C	24 g	25561	25034	25035
HayeSep C	250 °C	24 g	25562	25036	25037
HayeSep D	290 °C	24 g	25563	25038	25039
HayeSep DIP	290 °C	24 g	25564	25565	25566
HayeSep DB	290 °C	24 g	25567	25568	25569
HayeSep DOX	(Use HayeSep DB)				
HayeSep N	165 °C	24 g	25570	25045	25046
HayeSep P	250 °C	24 g	25571	25047	25048
HayeSep Q	275 °C	24 g	25572	25049	25050
HayeSep R	250 °C	24 g	25573	25051	25052
HayeSep S	250 °C	24 g	25574	25053	25054
HayeSep T	165 °C	24 g	25575	25055	25056

Tenax® Packings

Description	Temp. Limit	Min. Qty.	Mesh 60/80 cat.#	Mesh 80/100 cat.#
Tenax-TA	350 °C	10 g	25550	25551
Tenax-GR	350 °C	10 g	25552	25553

also available

Custom packing materials are also available. See **page 132**.

Liquid Phases for Custom Columns

We can prepare packed and micropacked columns from the extensive list of liquid phases shown here. We have many more liquid phases. If you don't see the phase you need, call Technical Service or contact your Restek representative for availability.

Phase	min./max. temp. (°C)
Apiezon L	50/300
p,p'-Azoxydiphenetole	132/140
BC-120	0/125
Bentone-34	0/180
bis (2-ethoxyethyl) adipate	0/150
bis (2-ethylhexyl) phthalate	150 max.
bis (2-methoxyethyl) adipate	20/100
n,n'-Bis(*p*-methoxylbenzylidene)-α,α'-bi-*p*-toluidine (BMBT)	189/225
Carbowax 1000	40/150
Carbowax 20M	60/225
Carbowax 20M-terephthalic acid	60/225
Carbowax 400	10/100
Carbowax 600	30/125
Cyclohexanedimethanol succinate	100/250
DC-11	0/300
DC-200	0/200
DC-550	20/250
DEGS-PS	20/200
Di(2-ethylhexyl)sebacate	0/125
Diethylene glycol succinate (DEGS)	20/200
Diethylene glycol adipate (DEGA)	0/200
Diisodecyl phthalate	0/175
2,4-Dimethylsulfolane	0/50
Di-*n*-decyl phthalate	10/175
Dinonyl phthalate	20/150
Ethylene glycol adipate	100/225
Ethylene glycol phthalate	100/200
Ethylene glycol succinate	100/200
FFAP	50/250
Fluorad FC-431, 50% solution in ethyl acetate	40/200
Hallcomid M-18-OL	8/150
Halocarbon 10-25	20/100
Halocarbon K-352	0/250
Halocarbon wax	50/150
Igepal® CO-880 (Nonoxynol)	100/200
Igepal CO-890	100/200
Krytox	-30/260
Neopentyl glycol adipate	50/225
Neopentyl glycol sebacate	50/225
Neopentyl glycol succinate	50/225
Nonoxynol (Igepal CO-880)	100/200
β,β-Oxydipropionitrile	0/75
OV-1, dimethyl (gum)	100/350
OV-1, vinyl	100/350
OV-3, phenyl methyl	0/350
OV-7, phenyl methyl dimethyl, 20% phenyl	0/350
OV-11, phenyl methyl dimethyl, 35% phenyl	0/350
OV-17, phenyl methyl, 50% phenyl	0/375
OV-22, phenyl methyl diphenyl, 65% phenyl	0/350
OV-25, phenyl methyl diphenyl, 75% phenyl	0/350
OV-61, diphenyl, 33% phenyl	0/350
OV-73, 5.5% diphenyl	0/325
OV-101, dimethyl (fluid)	0/350
OV-105, cyanopropyl methyl	0/275
OV-202, trifluoropropyl (fluid)	0/275
OV-210, trifluoropropyl (fluid)	0/275
OV-215, trifluoropropyl (gum)	0/275
OV-225, cyanopropyl methylphenyl methyl	0/265
OV-275, dicyanoallyl	25/250
OV-330, silicone - Carbowax	0/250
OV-351	50/270
OV-1701, vinyl	0/250
Phenyldiethanolamine succinate	0/230
Polethylene glycol adipate (EGA)	100/225
Polyphenyl ether (5 rings) OS-124	0/200
Polyphenyl ether (6 rings) OS-138	0/225
Polypropylene glycol	0/150
Rtx-1 (Rt-101)	0/350
Rt-1000	50/250
Rt-1200	25/200
Rt-1220	50/200
Rt-1500, Rt-1510	50/230
Rt-2100	0/350
Rt-2300	20/275
Rt-2330, Rt-2340	25/275
Rt-608Pkd	0/275
Rt-Sebaconitrile	25/110
Rt-XLSulfur	250 max.
SE-30, SE-52, SE-54	50/300
Silar 5 CP, Silar 10 CP	0/250
Sorbitol	150 max.
Squalane	20/100
Squalene	0/100
Stabilwax	40/240
Tetracyanoethylated pentaerythritol	30/175
THEED (Tetrahydroxyethlenediamine)	0/125
β,β-Thiodipropionitrile (TDPN)	100
Tricresyl phosphate	20/125
1,2,3-Tris (2-cyanoethoxy) propane (TCEP)	0/175
Triton X-100, Triton X-305	0/200
UC W982	0/300
UCON 50-HB-2000	0/200
UCON 50-HB-280-X	0/200
UCON 50-HB-5100	0/200
UCON HB-1800-X	200 max.
UCON LB-550-X	0/200
Versamid 900	190/275

Advantages of using Restek packed columns

- Reasonably priced.
- Low-bleed, long-lifetime bonded phases.
- Wide variety of supports and packings.
- Produced by experienced packed column chromatographers.

USP Liquid Phase & Solid Support Cross-Reference

Restek can meet all of your packed column needs for U.S. Pharmacopeia methods. Commonly used USP liquid phases and supports are listed below. Call Restek or your representative for a quote on your next packed column for pharmaceuticals.

USP	Phase Description	Restek-Supplied Equivalent
G1	Dimethylpolysiloxane oil	Rt-2100, OV-101, Rtx-1
G2	Dimethylpolysiloxane gum	OV-1, Rtx-1
G3	50% Phenyl-50% methylpolysiloxane	Rt-2250, OV-17
G4	Diethylene glycol succinate polyester	Rt-DEGS
G5	3-Cyanopropylpolysiloxane	Rt-2340
G6	Trifluoropropylmethylpolysiloxane	Rt-2401, OV-210
G7	50% 3-Cyanopropyl-50% phenylmethylsilicone	Rt-2300
G8	80% Bis (3-cyanopropyl)-20% phenylpolysiloxane	Rt-2330
G9	Methylvinylpolysiloxane	UCW 98
G10	Polyamide	Polyamide
G11	Bis(2 ethylhexyl) sebecate polyester	Bis(2 ethylhexyl) sebecate polyester
G12	Phenyldiethanolamine succinate polyester	Phenyldiethanolamine succinate polyester
G13	Sorbitol	Sorbitol
G14	Polyethylene glycol (average mol. wt. 950-1050)	Carbowax 1000
G15	Polyethylene glycol (average mol. wt. 3000-3700)	Carbowax 4000
G16	Polyethylene glycol compound (average mol. wt. 15,000), a high molecular weight compound of polyethylene glycol and a diepoxide linker	Carbowax 20M
G17	75% Phenyl-25% methylpolysiloxane	OV-25
G18	Polyalkylene glycol	UCON LB 550X
G19	25% Phenyl-25% cyanopropyl-50% methylsilicone	OV 225
G20	Polyethylene glycol (average mol. wt. 380-420)	Carbowax 400
G21	Neopentyl glycol succinate	Neopentyl glycol succinate
G22	Bis(2 ethylhexyl) phthalate	Bis(2 ethylhexyl) phthalate
G23	Polyethylene glycol adipate	EGA
G24	Diisodecyl phthalate	Diisodecyl phthalate
G25	Polyethylene glycol compound TPA, a high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with terephthalic acid	Carbowax 20M TPA
G26	25% 2-Cyanoethyl-75% methylpolysiloxane	Rt-XE 60
G27	5% Phenyl-95% methylpolysiloxane	SE-52, Rtx-5
G28	25% Phenyl-75% methylpolysiloxane	DC 550
G29	3,3'-Thiodipropionitrile	TDPN
G30	Tetraethylene glycol dimethyl ether	Tetraethylene glycol dimethyl ether
G31	Nonylphenoxypoly(ethyleneoxy)ethanol (average ethyleneoxy chain length is 30): nonoxynol 30	Igepal CO 880
G32	20% Phenylmethyl-80% dimethylpolysiloxane	OV-7
G33	20% Carborane®-80% methylsilicone	Dexsil 300
G34	Diethylene glycol succinate polyester stabilized with phosphoric acid	Rt-DEGS PS
G35	A high molecular weight compound of a polyethylene glycol and a diepoxide that is esterified with nitroterephthalic acid	Rt-1000
G36	1% Vinyl-5% phenylmethylpolysiloxane	SE 54, Rtx-5
G37	Polyimide	Polyimide
G38	Phase G1 containing a small amount of tailing inhibitor	Rt-2100/0.1% Carbowax 1500
G39	Polyethylene glycol (average mol. wt. 1500)	Carbowax 1500
G40	Ethylene glycol adipate	Rt-EGA

USP	Support Description	Restek-Supplied Equivalent
S1A	Siliceous earth, see method for details on treatment	Silcoport W
S1AB	Siliceous earth, treated as S1A and both acid- and base-washed	Silcoport WBW
S1C	Crushed firebrick, calcined or burned with a clay binder >900 °C, acid-washed, may be silanized	Chromosorb PAW or PAW DMDCS
SINS	Untreated siliceous earth	Chromosorb W- Non Acid Washed
S2	Styrene-divinylbenzene copolymer with nominal surface area of less than 50 m^2/g and an average pore diameter of 0.3 to 0.4 μm	Chromosorb 101
S3	Ethylvinylbenzene-divinylbenzene copolymer with nominal surface area of 500 to 600 m^2/g and an average pore diameter of 0.0075 μm	Hayesep Q
S4	Styrene-divinylbenzene copolymer with aromatic -O and -N groups having a nominal surface area of 400 to 600 m^2/g and an average pore diameter of 0.0076 μm	Hayesep R
S5	High molecular weight tetrafluorethylene polymer, 40- to 60-mesh	Chromosorb T
S6	Styrene-divinylbenzene copolymer having a nominal surface area of 250 to 350 m^2/g and an average pore diameter of 0.0091 μm	Chromosorb 102
S7	Graphitized carbon having a nominal surface area of 12 m^2/g	CarboBlack C
S8	Copolymer of 4-vinyl-pyridine and styrene-divinylbenzene	Hayesep S
S9	Porous polymer based on 2,6-diphenyl-p-phenylene oxide	Tenax TA
S10	Highly cross-linked copolymer of acrylonitrite and divinylbenzene	HayeSep C
S11	Graphitized carbon having a nominal surface area of 100 m^2/g, modified with small amounts of petrolatum and polyethylene glycol compound	CarboBlack B 80/120 3% Rt 1500
S12	Graphitized carbon having a nominal surface area of 100 m^2/g	CarboBlack B

Technical Service

For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.

Phone: 1-800-356-1688, ext. 4
Fax: 1-814-353-1568
e-mail: support@restek.com

Hours of operation (Eastern Time):
Monday - Thursday,
8:00 a.m. to 6:00 p.m.
Friday, 8:00 a.m. to 5:00 p.m.

Outside the U.S.? *Find a distributor at*

www.restek.com/**distributor**

Custom Coated Packing Materials

Custom coated packing materials can be made with any of the supports listed below. The liquid stationary phases available are listed on page 130 and the coating ranges are listed in the chart. Coated packings are available in minimum orders of 20 grams.

To order, contact your Restek representative for pricing and specify the following:

1) Stationary phase and stationary phase concentration
2) Support and support mesh size
3) Amount of packing needed

Ordering Example: (3%) (Rtx®-1) (Silcoport® P) (80/100) (20 g)

Support	Max. Coating %	Mesh Sizes
CarboBlack B	1–10%*	60/80, 80/120
CarboBlack B HT	1–10%	40/60
CarboBlack C	0.1–1%*	60/80, 80/100
HayeSep	15%	60/80, 80/100, 100/120
Porapak	15%	50/80, 80/100, 100/120

Please call for availability of the following supports:

Chromosorb 101-108	5%*/10%**	60/80, 80/100, 100/120
Chromosorb W HP	20%	45/60, 60/80, 80/100, 100/120
Chromosorb G HP	20%	45/60, 60/80, 80/100, 100/120
Chromosorb G, P or W (AW or NAW)***	10% (G) 25% (W)	45/60, 60/80, 80/100, 100/120
Chromosorb G, P or W (AW or DMDCS)***	10% (G) 25% (W)	45/60, 60/80, 80/100, 100/120
Chromosorb T	15%	40/60
Silcoport P	30%	80/100, 100/120
Silcoport W BW	20%	80/100, 100/120
Silcoport W (replacement for Chromosorb 750)	20%	80/100, 100/120

*Nonsilicone phase.
**Silicone phase.
***Note: Chromosorb W (AW only) maximum coating is 25%.

NAW—nonacid washed
AW—acid washed
DMDCS—dimethyldichlorosilane
BW—base washed

For coatings over 15% or quantities over 50 grams, please call your Restek representative.

ordering note

Mesh Size
When ordering a packed column solid support, please specify mesh size. Refer to this chart to convert microns to mesh size.

Example:
150–180 micron particles = 80/100 mesh

(µm)	Mesh Size
850	20
710	25
600	30
500	35
425	40
355	45
300	50
250	60
212	70
180	80
150	100
125	120
106	140
90	170
75	200
63	230
53	270

ordering note

Special phases that require a surcharge:
OV®-275, OV®-330, OV®-225, BMBT, 2,4-dimethylsulfolane, Silar, OV®-1701, and XE-60. Call your Restek representative for pricing.

Custom Packed Columns

To order, specify the following:

1) Column dimensions (length, ID) and tubing material
2) Packing description (percent coating and phase, support mesh size, and treatment)
3) Column configuration (instrument manufacturer, model number, on-column injection or not) and with or without nuts and ferrules

Ordering Example: (6' x 1/8") (stainless steel) (3%) (Rtx®-1) (Silcoport® 80/100) (Agilent 6890) (on-column injection) (fittings kit)

Please use the custom order form on page 134 or visit
www.restek.com/packed

did you know?

Packing material in packed and micropacked columns is secured using wire braids or frits. This prevents packing material from exiting the column.

Custom Micropacked Columns

To order, contact your Restek representative and specify the following:

1) Physical dimensions (length, OD, ID, and tubing material)
2) Packing description (percent coating and phase, support mesh size)
3) Installation kit (see page 125), frit type

Ordering Example: (2 m x 1/16" OD x 1.00 mm ID) (Siltek®-treated tubing) (5%) (Carbowax® 20M) (CarboBlack B) (80/120) (installation kit for valve applications, cat. #21065) (Siltek® frits)

Please use the custom order form on page 134 or visit
www.restek.com/packed

ordering note

For international pricing on custom packed or micropacked columns, please contact your Restek representative.

Packed/Micropacked Column Custom Order Form

Order: _____ Quote: _____ Reference # from previous order (if available): _____

Date: _____

Restek Account #: _____

Contact: _____

Company: _____

Address: _____

_____

Phone: _____

Fax: _____

Email: _____

Restek Use Only:

Custom No.: _____

Stock No.: _____

Price: _____

Fitting Costs: _____

Authorization:

_____

Number of Columns: _____

1) Column Dimensions:

   Length _____ OD x ID: _____

2) Tubing (choose one): ❍ SilcoSmooth® ❍ Stainless Steel ❍ Hastelloy® ❍ Nickel ❍ Copper ❍ PTFE

3) Packing Description:

   Liquid Phase A (% + description): _____

   Liquid Phase B (% + description): _____

   Liquid Phase C (% + description): _____

   Solid Support: _____ Mesh: _____

4) Column Configuration:

   Instrument (mfr. + model): _____

   Inlet: Packed Full? ❍ Yes ❍ No, leave_____" void (for on-column injection)

   Outlet: Packed Full? ❍ Yes ❍ No, leave_____" void

   Do you want this column preconditioned? ❍ Yes (additional charge) ❍ No

   Standard configuration suffix number (next page)**:**

   Frits ❍ Hastelloy® ❍ Siltek®

   Special configuration (next page): Figure: _____ Dimensions: _____

   Welded Tubing Reducers ❍ (additional charge)

   Special Instructions: _____

Fittings (check appropriate circle)

❍ **KIT 1S**
1/4" brass nuts
1/4" to 1/8" V/G reducing ferrules
No additional charge

❍ **KIT 2S**
1/4" brass nuts
1/4" to 3/16" V/G reducing ferrules
No additional charge

❍ **KIT A**
1/8" brass nuts
1/8" V/G ferrules
No additional charge

❍ **KIT B**
1/8" brass nuts
1/8" brass front & back ferrules
No additional charge
V/G = Vespel®/graphite

❍ **KIT C**
1/8" stainless steel nuts
1/8" stainless steel front & back ferrules
Additional charge

❍ **KIT D**
1/8" stainless steel nuts
1/8" V/G ferrules
Additional charge

❍ **KIT E**
1/4" stainless steel nuts
1/4" to 1/8" V/G reducing ferrules
Additional charge

❍ **KIT F**
1/4" stainless steel nuts
1/4" to 3/16" V/G reducing ferrules
Additional charge

❍ **KIT V**
1/8" VCR fitting
check appropriate circle:
❍ Stainless Steel (additional charge)
❍ Nickel (additional charge)

for a quote:

Complete this form and fax to Restek at 814-353-1309, or to your Restek representative.

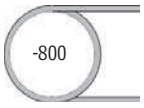
This form is also available online at:

www.restek.com/**packed**

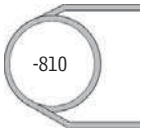
Column Configurations

Standard Configurations (choose one)

General Configuration



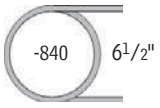
Agilent 5880, 5890, 5987, 6890, 7890



Bruker 430, 450 (Varian 3700, Vista Series, FID)

PE 900-3920, Sigma 1,2,3

PE Auto System 8300, 8400, 8700



-810	Agilent 5880, 5890, 5987, 6890, 7890
-811	Agilent 6850
-820	Bruker 430, 450 (Varian 3700,Vista Series, FID)
-821	Bruker 430, 450 (Varian 3800)
-830	PerkinElmer 900-3920, Sigma 1,2,3
-840	PerkinElmer Auto System 8300, 8400, 8700, Clarus 500 (C500)
-841	PerkinElmer Auto Sys XL
-845	ABB 3100, AAI (4" coil)
-850	Shimadzu 14A, 2014
-851	Shimadzu 8A
-852	Shimadzu 9A
-853	Shimadzu 17A, 2010
-854	Shimadzu Mini 2
-860	Thermo Scientific - TRACE 2000
-865	Carlo Erba
-870	Tremetrics/Tracor
-874	HNU 310 & 311 (4.5" coil)
-875	Analytical Controls Configuration
-880	Carle 40030
-881	Hitachi 263
-885	Pye Unicam 4500
-890	Gow Mac 590
-891	Gow Mac 550
-892	Gow Mac 750
-893	Gow Mac 816 (3" coil, 3" spread on the arms, and a total height of 5")
-894	Gow Mac 580
-895	SRI 8610C
-895R	SRI 8610C Dual GC Right Side
-895L	SRI 8610C Dual GC Left Side
-896	SRI 9300

Custom Configurations (Please provide dimensions on order form, page 134, or at **www.restek.com/packed**)

Figure 1

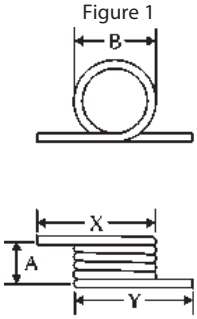


Figure 2

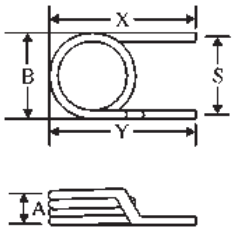


Figure 3

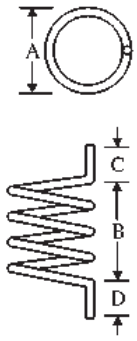


Figure 4

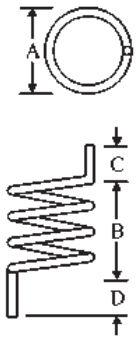


Figure 5

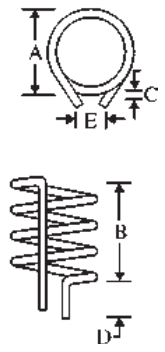


Figure 6

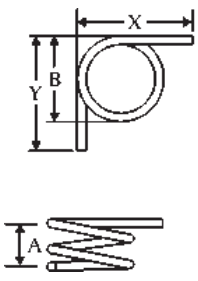


Figure 7

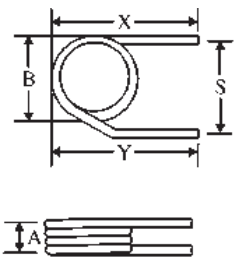


Figure 8

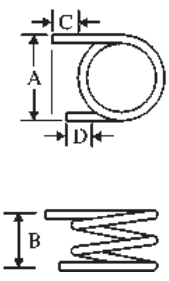


Figure 9

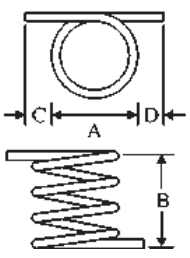


Figure 10

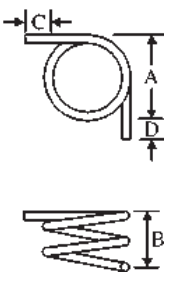


Figure 11

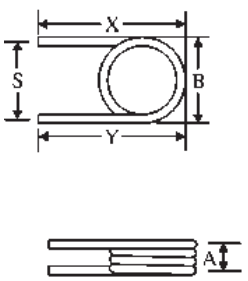


Figure 12

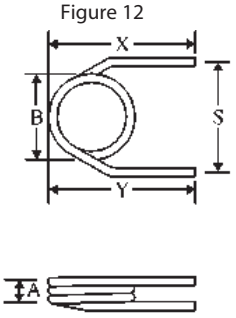


Figure 13

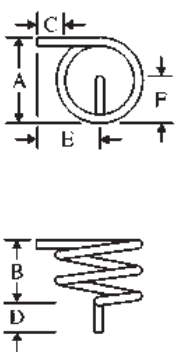


Figure 14

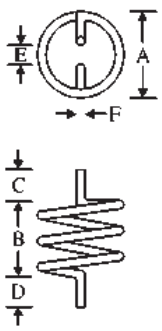
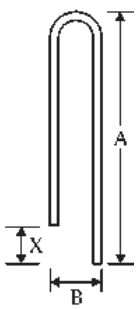


Figure 15



LC Columns

RESTEK USLC®

Ultra Selective Liquid Chromatography
www.restek.com/uslc

Ultra Selective Liquid Chromatography Technology

Choose Columns Fast. Develop Methods Faster.

What is Ultra Selective Liquid Chromatography (USLC®) technology? This technique is the directed application of orthogonal selectivity—the most influential factor affecting peak separation, or resolution—to provide the practicing chromatographer with the best tools for choosing columns fast and developing methods faster. Through our extensive study of reversed-phase chromatography Restek created the widest range of selectivity in the industry using just four unique stationary phases: the USLC® column set. We also defined a simple approach to choosing a column with the appropriate selectivity for any application.

Selectivity Drives Separations

Quickly and effectively resolve analytes by understanding and controlling selectivity through USLC® technology.

One of the most significant, yet least understood, steps of method development is finding the proper stationary phase for a particular separation. As sample complexity increases, achieving adequate resolution between matrix components and target analytes becomes more difficult. Despite recent advancements in column format, such as sub-2-micron packings and pellicular particles, resolution can still be difficult to obtain because, while these formats can increase chromatographic efficiency and analysis speed, they do not significantly influence resolution. Selectivity, as shown in Equation 1, is the single most powerful factor affecting resolution, and it is largely dependent upon stationary phase composition.

Equation 1: Selectivity has the greatest mathematical effect on resolution.

$$R = \tfrac{1}{4}\sqrt{N} \times (k/[k+1]) \times (\alpha-1)$$

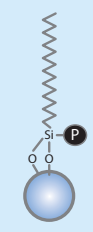
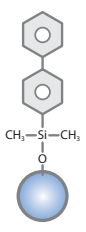
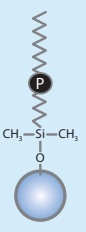
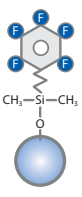
Efficiency *Retention Factor* *Selectivity*

Real Diversity in Phase Chemistry

A small set of defined orthogonal columns means faster separations and more robust methods.

While numerous bonded phases are available for reversed-phase chromatography, many (e.g., C8 and C18) are similar and offer only moderate changes in retention, rather than significant differences in selectivity. Method development is less laborious and time-consuming when you use a full range of column selectivities, including orthogonal phase chemistries like polar-embedded, phenyl, and fluorophenyl columns. Restek has led the development of the unique USLC® column set across these phase classes to provide analysts with a more effective range of column selectivities and innovative column chemistries for method development. The USLC® column set (Figure 1) provides the widest range of reversed-phase selectivity available with just four columns and can be used to guide proper stationary phase selection—the least understood yet most significant part of method development.

Figure 1: Restek columns offer the widest range of unique and effective phase chemistries to aid the chromatographer in choosing columns fast and developing methods faster.

Restek USLC® Phase (column class)	**Aqueous C18** (alkyl)	**Biphenyl** (phenyl)	**IBD** (polar embedded)	**PFP Propyl** (fluorophenyl)
	 Aqueous C18	 Biphenyl	 IBD	 PFP Propyl
Ligand Type	Proprietary polar modified and functionally bonded C18	Unique Biphenyl	Proprietary polar functional embedded alkyl	Fluorophenyl
Properties	• General-purpose with a well-balanced retention profile. • Compatible with 100% aqueous mobile phases. • Ideal for multi-component LC-MS analyses.	• Increased retention for dipolar, unsaturated, or conjugated solutes. • Enhanced selectivity when used with protic (methanol) mobile phase. • Ideal for increasing sensitivity and selectivity in LC-MS analyses.	• Increased retention for acids and water-soluble compounds. • Compatible with 100% aqueous mobile phases. • Capable of both reversed-phase and HILIC separations.	• Increased retention for both charged bases and electronegative compounds. • Capable of both reversed-phase and HILIC separations. • Ideal for increasing sensitivity and selectivity in LC-MS analyses.

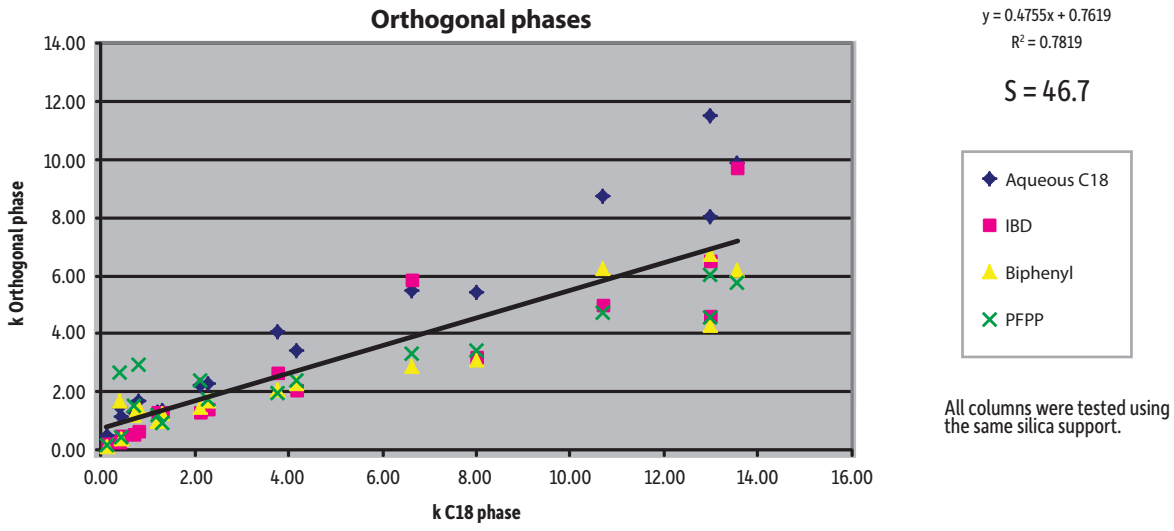
Evaluating and Extending Selectivity

The Restek USLC® column set offers the highest range of alternate selectivity available.

The diverse selectivity provided by USLC® columns can be demonstrated empirically using the hydrophobic-subtraction model [1]. This model is a novel procedure for characterizing selectivity that uses test probes to define the solute and stationary phase interactions in reversed-phase separations. Restek is leading the commercial application of this model by implementing it in the development of USLC® bonded phases. To evaluate phase selectivity using the hydrophobic-subtraction model, the retention characteristics of the solute probes are compared across different phases relative to a C18 benchmark with all columns using the same silica base.

The resulting scatter plot is an excellent way to visualize selectivity. Stationary phases with similar selectivity show high linearity when graphed. However, stationary phases with alternate selectivity—even orthogonality—produce significant scatter around the regression line. The high degree of scatter shown in Figure 2 shows just how diverse the phases in the USLC® column set are. When we quantify column selectivity based on this correlation by calculating the selectivity (S) statistic [2], the resulting value of 46.7 shows that the USLC® column set truly has the highest range of selectivity available.

Figure 2: Restek has extended the selectivity range for commercially available columns and defined a column set—the four USLC® phases—that is ideal for fast column choice and faster method development.



References

[1] L.R. Snyder, J.W. Dolan, P.W. Carr, The Hydrophobic-Subtraction Model of Reversed-Phase Column Selectivity, J. Chromatogr. A 1060 (2004) 77.

[2] U.D. Neue, J.E. O'Gara, A. Mendez, Selectivity in Reversed-Phase Separations influence of the Stationary Phase, J. Chromatogr. A 1127 (2006) 161.

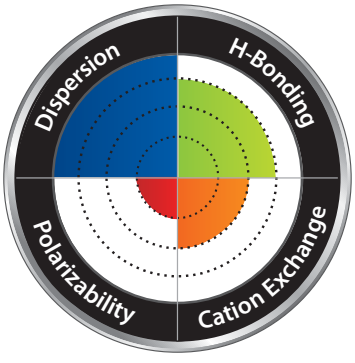
USLC® Column Interaction Profile

Put simply, selectivity is the retention of one compound relative to another. Therefore, because solutes will be retained to different degrees by different molecular interactions, we can fundamentally define a column's selectivity based on the molecular interactions it delivers.

Each USLC® column is optimized for a different chemical interaction. The pie chart provided for each USLC® stationary phase in this catalog (Figure 3) identifies the same four molecular interactions (color coded to correspond to the retention of a different solute type). The more rings shown for a given interaction, the more significant a role it plays in defining solute retention.

If you know what type of column interaction you need for your analysis, use these charts to select your USLC® column.

Figure 3: Sample USLC® Column Interaction Profile



USLC® Method Development Toolbox

- Ultra Selective Liquid Chromatography (USLC®) method development toolbox contains all four USLC® stationary phases in one convenient package.
- Available for UHPLC (1.9 µm) and HPLC (3 or 5 µm) in 50, 100, or 150 mm lengths.
- Included selection guide makes it even easier to pick the right column the first time.

Description	Size	Includes	qty.	cat.#
Pinnacle DB USLC Method Development Toolbox	1.9 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9409252), Aqueous C18 (9418252), IBD (9425252), PFP Propyl (9419252)	kit	25800
Pinnacle DB USLC Method Development Toolbox	1.9 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9409212), Aqueous C18 (9418212), IBD (9425212), PFP Propyl (9419212)	kit	25807
Ultra USLC Method Development Toolbox	3 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9109352), Aqueous C18 (9178352), IBD (9175352), PFP Propyl (9179352)	kit	25801
Ultra USLC Method Development Toolbox	3 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9109312), Aqueous C18 (9178312), IBD (9175312), PFP Propyl (9179312)	kit	25802
Ultra USLC Method Development Toolbox	3 µm, 3.0 mm x 100 mm	(1) each: Biphenyl (910931E), Aqueous C18 (917831E), IBD (917531E), PFP Propyl (917931E)	kit	25803
Ultra USLC Method Development Toolbox	5 µm, 2.1 mm x 50 mm	(1) each: Biphenyl (9109552), Aqueous C18 (9178552), IBD (9175552), PFP Propyl (9179552)	kit	25804
Ultra USLC Method Development Toolbox	5 µm, 2.1 mm x 100 mm	(1) each: Biphenyl (9109512), Aqueous C18 (9178512), IBD (9175512), PFP Propyl (9179512)	kit	25805
Ultra USLC Method Development Toolbox	5 µm, 4.6 mm x 150 mm	(1) each: Biphenyl (9109565), Aqueous C18 (9178565), IBD (9175565), PFP Propyl (9179565)	kit	25806

USLC® Columns
Choose Columns Fast.
Develop Methods Faster.

www.restek.com/**uslc**

Mobile Phase Management 101

Neatly Keep Mobile Phase Lines Where They Belong

Hub-Cap
See **page 318**.


Hub-Cap (assembly of the bottle cap and plug)

Transfer and Filter Mobile Phase in a Single Step

Hub-Cap Filters
See **page 319**.

Reduce Solvent Waste

Last Drop Filter
See **page 320**.

Avoid Messy Spills Around Mobile Phase Waste Containers

Waste Overflow Indicator
See **page 319**.

Prepare and Maintain Mobile Phases Without Dissolved Gas or Unnecessary Costs

Mobile Phase Sparge Filter
See **page 320**.

U.S. Pharmacopeia Cross Reference

L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles; 1.7 to 10 µm in diameter, or a monolithic rod. *Pinnacle® DB C18 (p. 143), Pinnacle® DB Aqueous C18 (p. 144), Ultra C18 (p. 149), Ultra Aqueous C18 (p. 151), Viva C18 (p. 155)*
L3	Porous silica particles; 5 to 10 µm in diameter. *Pinnacle® DB Silica (p. 147), Ultra Silica (p. 154), Viva Silica (p. 157)*
L7	Octylsilane chemically bonded to totally porous silica particles; 1.7 to 10 µm in diameter. *Pinnacle® DB C8 (p. 143), Ultra C8 (p. 149), Viva C8 (p. 155)*
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support; 3 to 10 µm in diameter. *Ultra Amino (p. 154)*
L10	Nitrile groups chemically bonded to porous silica particles; 3 to 10 µm in diameter. *Pinnacle® DB Cyano (p. 147), Ultra Cyano (p. 154)*
L11	Phenyl groups chemically bonded to porous silica particles; 1.7 to 10 µm in diameter. *Pinnacle® DB Biphenyl (p. 145), Ultra Aromax (p. 151), Ultra Biphenyl (p. 152), Viva Biphenyl (p. 156)*
L13	Trimethylsilane chemically bonded to porous silica particles; 3 to 10 µm in diameter. *Ultra C1 (p. 150)*
L26	Butyl silane chemically bonded to totally porous silica particles; 3 to 10 µm in diameter. *Ultra C4 (p.150), Viva C4 (p.156)*
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer; 5 to 10 µm in diameter. *Pinnacle® DB PFP Propyl (p. 146), Ultra PFP Propyl (p. 153), Viva PFP Propyl (p. 156)*
L68	Spherical, porous silica; 100 µm or less in diameter, the surface of which has been covalently modified with alkyl amide groups and not end-capped. *Pinnacle® DB IBD (p. 146), Ultra IBD (p. 153)*

Optimal Flow Rates for Various Particle Diameters and Column Internal Diameters

Column ID (mm)	Optimal flow rate (mL/min)		
	1.9 µm dp	3 µm dp	5 µm dp
4.6	—	1.50	1.00
3.2	—	0.73	0.50
3.0	1.12	0.65	0.40
2.1	0.55	0.31	0.20
1.0	—	0.07	0.05

Common Classifications for LC Columns by Internal Diameter

Classification	Internal Diameter
Capillary	<1.0 mm ID
Micro bore	1.0 mm ID
Narrow bore	2.1–3.0 mm ID
Standard bore	3.2–4.6 mm ID
Semi-prep	10–21.2 mm ID
Prep	30–50 mm ID

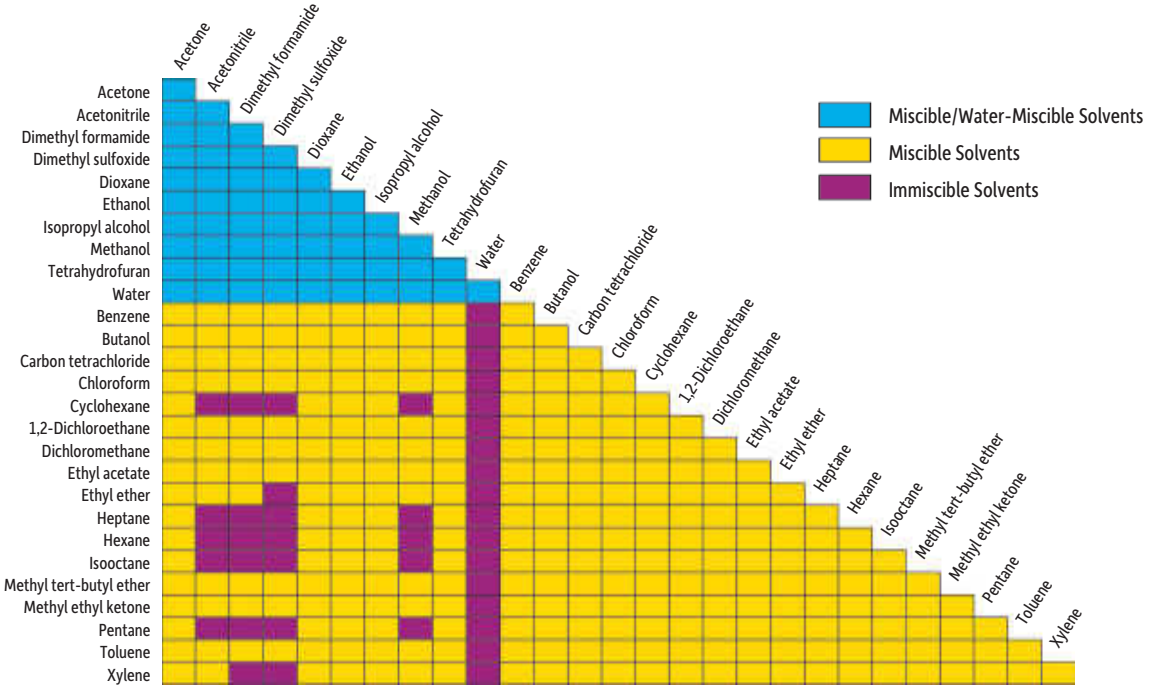
HPLC Pump Pressure Conversion Table

Pressure	psi	atm	kg/cm²	torr	kPa	bar	inches Hg
1 psi =	1	0.068	0.0703	51.713	6.8948	0.06895	2.0359
1 atm =	14.696	1	1.0332	760	101.32	1.0133	29.921
1 kg/cm² =	14.223	0.967	1	735.5	98.06	0.9806	28.958
1 torr =	0.0193	0.00132	0.00136	1	0.1330	0.00133	0.0394
1 kPa =	0.1450	0.00987	0.0102	7.52	1	0.0100	0.2962
1 bar =	14.5038	0.9869	1.0197	751.88	100	1	29.5300
1 in Hg =	0.49612	0.0334	0.0345	25.400	3.376	0.03376	1

To convert a pressure, multiply the units in the left-most column by the conversion factors listed in the columns to the right.

For example: 10 psi x 0.068 = 0.68 atm
10 bar x 29.5300 = 295.300 inches Hg

Solvent Miscibility and Solubility



Pinnacle® DB Columns:
1.9, 3, or 5 µm particles; 140 Å pore size

Restek Pinnacle® DB columns are built for optimal UHPLC performance.

Pinnacle® DB columns are 100% manufactured by Restek in our Bellefonte, Pennsylvania, facility. Because performance begins with the support, our Pinnacle® DB UHPLC columns start with base-deactivated spherical silica that is optimized for UHPLC stability. From there, we bond them with a wide variety of phases to give chromatographers a stable and selective column. Get the most out of your UHPLC system. Combine selectivity and efficiency by using Restek Pinnacle® DB UHPLC columns.

Get Even More Out of Your UHPLC System

Combine UHPLC Efficiency With Restek Selectivity

Restek-manufactured silica

The following stationary phases are available for UHPLC:

USLC® Columns:

Conventional Columns:

www.restek.com/**LC-Columns**

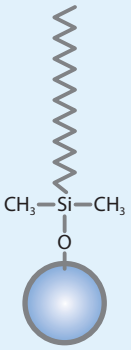
Pinnacle® DB C18 Columns (USP L1)

Restek-manufactured silica

Chromatographic Properties

The general-purpose Restek C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns				
30 mm		9414232		
50 mm		9414252		
100 mm		9414212		
3 µm Columns				
30 mm	9414331	9414332	941433E	9414335
50 mm	9414351	9414352	941435E	9414355
100 mm	9414311	9414312	941431E	9414315
5 µm Columns				
30 mm	9414531	9414532	941453E	9414535
50 mm	9414551	9414552	941455E	9414555
100 mm	9414511	9414512	941451E	9414515
150 mm	9414561	9414562	941456E	9414565
200 mm	9414521	9414522	941452E	9414525
250 mm	9414571	9414572	941457E	9414575



C18

Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18

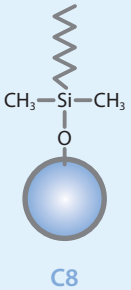
Pinnacle® DB C8 Columns (USP L7)

Restek-manufactured silica

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek C8 is suitable for a wide range of compounds from acidic through slightly basic.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns				
30 mm		9413232		
50 mm		9413252		
100 mm		9413212		
3 µm Columns				
30 mm	9413331	9413332	941333E	9413335
50 mm	9413351	9413352	941335E	9413355
100 mm	9413311	9413312	941331E	9413315
5 µm Columns				
30 mm	9413531	9413532	941353E	9413535
50 mm	9413551	9413552	941355E	9413555
100 mm	9413511	9413512	941351E	9413515
150 mm	9413561	9413562	941356E	9413565
200 mm	9413521	9413522	941352E	9413525
250 mm	9413571	9413572	941357E	9413575



C8

Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8

Looking for an equivalent column?

Restek has extensively studied column selectivity and can provide you with an accurate recommendation. Please contact Restek Technical Support or your local Restek representative.

also available

Trident Direct Guard Column System

See page 169.

Restek-manufactured silica

Pinnacle® DB Aqueous C18 Columns (USP L1)

Chromatographic Properties

The Restek Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multi-component LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous and acidic. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

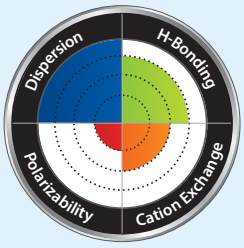
Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18

Aqueous C18

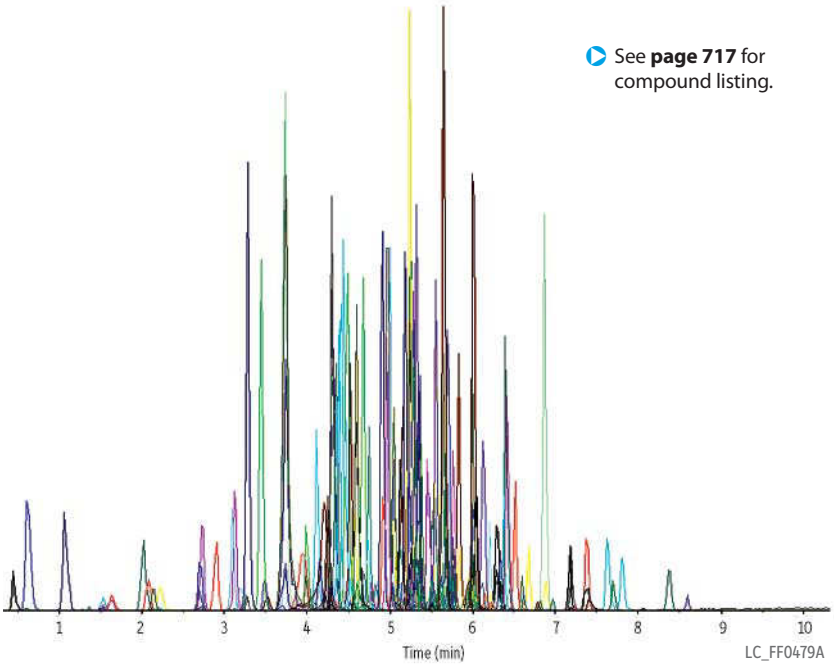
USLC® Column Interaction Profile

(See page 138 for more information.)



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns				
30 mm		9418232		
50 mm		9418252		
100 mm		9418212		
3 µm Columns				
30 mm	9418331	9418332	941833E	9418335
50 mm	9418351	9418352	941835E	9418355
100 mm	9418311	9418312	941831E	9418315
150 mm	9418361	9418362	941836E	9418365
5 µm Columns				
30 mm	9418531	9418532	941853E	9418535
50 mm	9418551	9418552	941855E	9418555
100 mm	9418511	9418512	941851E	9418515
150 mm	9418561	9418562	941856E	9418565
200 mm	9418521	9418522	941852E	9418525
250 mm	9418571	9418572	941857E	9418575

Pesticides on Pinnacle® DB Aqueous C18 (LC-MS/MS, ESI+)



See **page 717** for compound listing.

Column	Pinnacle® DB Aqueous C18 (cat.# 9418252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	35 °C
Sample	multicomponent pesticide standard
Diluent:	water
Conc.:	33.3 ppb each pesticide
Inj. Vol.:	5 µL
Mobile Phase	
A:	10 mM NH_4OAc in water
B:	10 mM NH_4OAc in methanol

Time (min)	%B
0	10
1	10
8	90
10	90
11	10

Flow:	0.60 mL/min
Max Pressure:	~517 bar
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	4000 QTRAP® LC-MS/MS system
Ion Source:	TurboIonSpray®
Ion Spray Voltage:	5 kV
Gas 1:	40 psi (275.8 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	500 °C
Instrument	Shimadzu UFLCXR

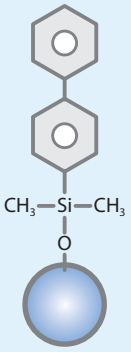
Pinnacle® DB Biphenyl Columns (USP L11)

Restek-manufactured silica

Chromatographic Properties

The Restek Biphenyl offers a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns				
30 mm		9409232		
50 mm		9409252		
100 mm		9409212		
3 µm Columns				
30 mm	9409331	9409332	940933E	9409335
50 mm	9409351	9409352	940935E	9409355
100 mm	9409311	9409312	940931E	9409315
150 mm	9409361	9409362	940936E	9409365
5 µm Columns				
30 mm	9409531	9409532	940953E	9409535
50 mm	9409551	9409552	940955E	9409555
100 mm	9409511	9409512	940951E	9409515
150 mm	9409561	9409562	940956E	9409565
200 mm	9409521	9409522	940952E	9409525
250 mm	9409571	9409572	940957E	9409575

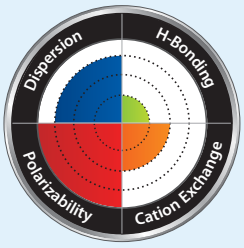


Biphenyl

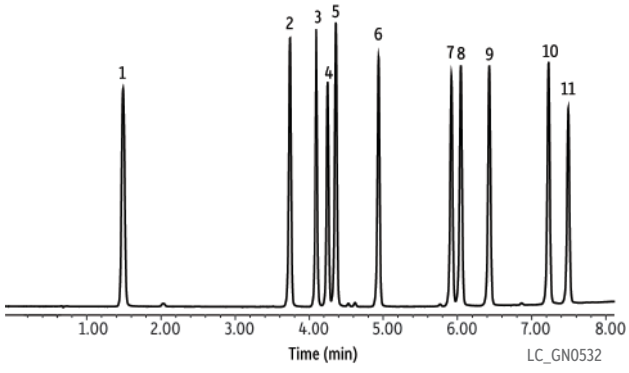
Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl

USLC® Column Interaction Profile
(See page 138 for more information.)



Sulfur Antibiotics by UHPLC on Pinnacle® DB Biphenyl



Column	Pinnacle® DB Biphenyl (cat.# 9409212)
Dimensions:	100 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	25 °C
Sample	
Diluent:	0.1% Formic acid in water
Conc.:	50 µg/mL
Inj. Vol.:	2 µL
Mobile Phase	
A:	0.1% Formic acid in water
B:	0.1% Formic acid in acetonitrile

Time (min)	%A	%B
0	95	5
8	60	40

Flow:	0.4 mL/min
Detector	UV/Vis @ 265 nm
Instrument	Shimadzu UFLCXR

	Peaks	RT (min)
1.	Sulfanilamide	1.55
2.	Sulfadiazine	3.74
3.	Sulfapyridine	4.09
4.	Sulfathiazole	4.24
5.	Sulfamerazine	4.35
6.	Sulfamethazine	4.91
7.	Sulfachlorpyridazine	5.87
8.	Sulfadoxine	5.99
9.	Sulfisoxazole	6.37
10.	Sulfadimethoxine	7.14
11.	Sulfaquinoxaline	7.40

Pinnacle® DB IBD UHPLC Columns (USP L68)

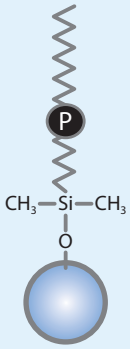
Restek-manufactured silica

Chromatographic Properties

The Restek IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

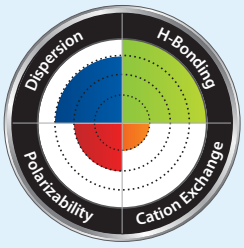
Column Characteristics:

particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar-embedded alkyl
ligand type:	proprietary polar functional embedded alkyl



IBD

USLC® Column Interaction Profile
(See page 138 for more information.)



Length	2.1 mm ID cat.#
1.9 µm Columns	
30 mm	9425232
50 mm	9425252
100 mm	9425212

Pinnacle® DB PFP Propyl Columns (USP L43)

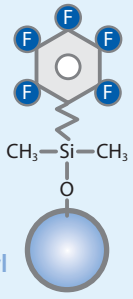
Restek-manufactured silica

Chromatographic Properties

The Restek PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, however, the Restek PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

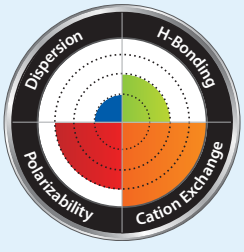
Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
carbon load:	6%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl



PFP Propyl

USLC® Column Interaction Profile
(See page 138 for more information.)



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
1.9 µm Columns				
30 mm		9419232		
50 mm		9419252		
100 mm		9419212		
3 µm Columns				
30 mm	9419331	9419332	941933E	9419335
50 mm	9419351	9419352	941935E	9419355
100 mm	9419311	9419312	941931E	9419315
150 mm	9419361	9419362	941936E	9419365
5 µm Columns				
30 mm	9419531	9419532	941953E	9419535
50 mm	9419551	9419552	941955E	9419555
100 mm	9419511	9419512	941951E	9419515
150 mm	9419561	9419562	941956E	9419565
200 mm	9419521	9419522	941952E	9419525
250 mm	9419571	9419572	941957E	9419575

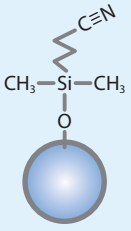
Pinnacle® DB Cyano Columns (USP L10)

Restek-manufactured silica

Chromatographic Properties

The Restek Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
1.9 µm Columns				
30 mm		9416232		
50 mm		9416252		
100 mm		9416212		
5 µm Columns				
30 mm	9416531	9416532	941653E	9416535
50 mm	9416551	9416552	941655E	9416555
100 mm	9416511	9416512	941651E	9416515
150 mm	9416561	9416562	941656E	9416565
200 mm	9416521	9416522	941652E	9416525
250 mm	9416571	9416572	941657E	9416575



Cyano

Column Characteristics:

particle size:	1.9 µm or 5 µm, spherical
pore size:	140 Å
carbon load:	4%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropylsilane

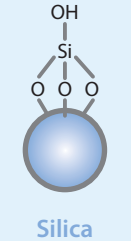
Pinnacle® DB Silica Columns (USP L3)

Restek-manufactured silica

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
1.9 µm Columns				
30 mm		9410232		
50 mm		9410252		
100 mm		9410212		
3 µm Columns				
30 mm	9410331	9410332	941033E	9410335
50 mm	9410351	9410352	941035E	9410355
100 mm	9410311	9410312	941031E	9410315
150 mm	9410361	9410362	941036E	9410365
5 µm Columns				
30 mm	9410531	9410532	941053E	9410535
50 mm	9410551	9410552	941055E	9410555
100 mm	9410511	9410512	941051E	9410515
150 mm	9410561	9410562	941056E	9410565
200 mm	9410521	9410522	941052E	9410525
250 mm	9410571	9410572	941057E	9410575



Silica

Column Characteristics:

particle size:	1.9 µm, 3 µm, or 5 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none

Restek-manufactured silica

Pinnacle® DB PAH UHPLC Columns

Chromatographic Properties

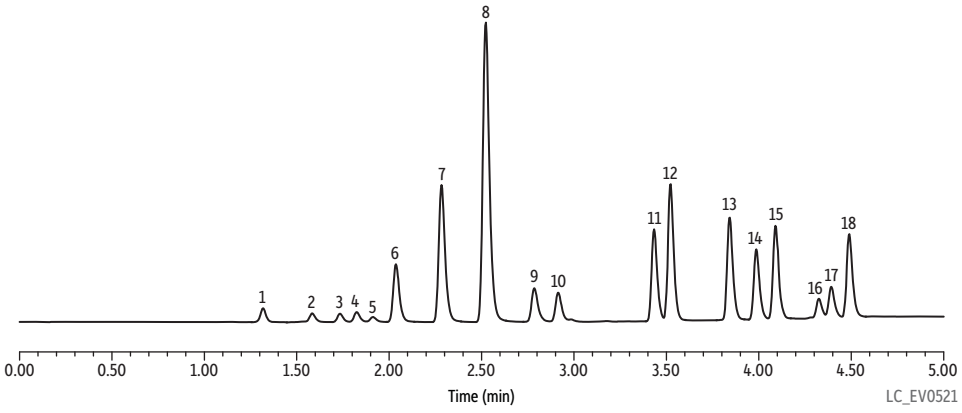
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons (PAHs). Get complete resolution of all 16 EPA 610 PAHs, plus two other routinely analyzed PAH compounds, in less than five minutes to greatly reduce run times and increase sample throughput.

Column Characteristics:

particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

Length	2.1 mm ID cat.#
1.9 µm Columns	
30 mm	9470232
50 mm	9470252
100 mm	9470212

PAH Mix on Pinnacle® DB PAH



Peaks
1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

Column	Pinnacle® DB PAH (cat.# 9470252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	EPA Method 8310 PAH Mixture (cat.# 31841)
Diluent:	acetonitrile
Conc.:	10 µg/mL
Inj. Vol.:	1 µL

Mobile Phase
A: water
B: acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0	0.8	60	40
2	0.8	40	60
4	0.8	0	100
4.5	0.8	0	100
4.51	0.8	60	40
5	0.8	60	40

Max Pressure: 724 bar
Detector Photo diode array @ 254, 4.8 nm
Instrument Waters

Ultra HPLC Columns: 3 or 5 µm particles; 100 Å pore size

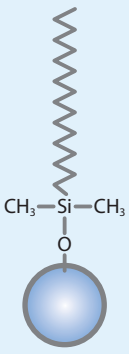
The Ultra line represents Restek's broadest selection of stationary phases on a single silica support. Made of high-purity, type-B silica that minimizes activity and creates high-density bonding, these columns are designed for selective and reliable HPLC applications.

Ultra C18 Columns (USP L1)

Chromatographic Properties

The general-purpose Restek C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**	**cat.#**
3 µm Columns					
30 mm	9174331	9174332	917433E		9174335
50 mm	9174351	9174352	917435E		9174355
100 mm	9174311	9174312	917431E		9174315
150 mm	9174361	9174362	917436E		9174365
5 µm Columns					
30 mm	9174531	9174532	917453E		9174535
50 mm	9174551	9174552	917455E		9174555
100 mm	9174511	9174512	917451E	9174514	9174515
150 mm	9174561	9174562	917456E	9174564	9174565
200 mm	9174521	9174522	917452E		9174525
250 mm	9174571	9174572	917457E		9174575



C18

Column Characteristics:

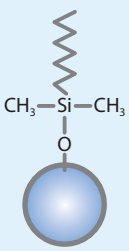
particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	20%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18

Ultra C8 Columns (USP L7)

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek C8 is suitable for a wide range of compounds from acidic through slightly basic.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**	**cat.#**
3 µm Columns					
30 mm	9103331	9103332	910333E		9103335
50 mm	9103351	9103352	910335E		9103355
100 mm	9103311	9103312	910331E		9103315
150 mm	9103361	9103362	910336E		9103365
5 µm Columns					
30 mm	9103531	9103532	910353E		9103535
50 mm	9103551	9103552	910355E		9103555
100 mm	9103511	9103512	910351E	9103514	9103515
150 mm	9103561	9103562	910356E	9103564	9103565
200 mm	9103521	9103522	910352E		9103525
250 mm	9103571	9103572	910357E		9103575



C8

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8

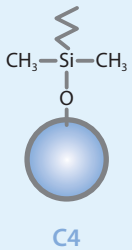
Ultra C4 Columns (USP L26)

Chromatographic Properties

Exceptionally stable C4 packing with high bonding coverage and base deactivation. Less retention than C18 or C8 phases.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	9%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C



C4

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9102331	9102332	910233E	9102335
50 mm	9102351	9102352	910235E	9102355
100 mm	9102311	9102312	910231E	9102315
150 mm	9102361	9102362	910236E	9102365
5 µm Columns				
30 mm	9102531	9102532	910253E	9102535
50 mm	9102551	9102552	910255E	9102555
100 mm	9102511	9102512	910251E	9102515
150 mm	9102561	9102562	910256E	9102565
200 mm	9102521	9102522	910252E	9102525
250 mm	9102571	9102572	910257E	9102575

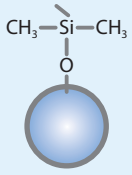
Ultra C1 Columns (USP L13)

Chromatographic Properties

Exceptionally stable C1 phase. Least retentive reversed-phase hydrocarbon packing.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	5%
pH range:	2.5 to 8
temperature limit:	80 °C



C1

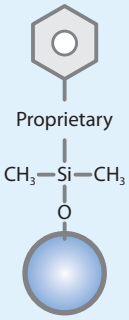
Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9101331	9101332	910133E	9101335
50 mm	9101351	9101352	910135E	9101355
100 mm	9101311	9101312	910131E	9101315
150 mm	9101361	9101362	910136E	9101365
5 µm Columns				
30 mm	9101531	9101532	910153E	9101535
50 mm	9101551	9101552	910155E	9101555
100 mm	9101511	9101512	910151E	9101515
150 mm	9101561	9101562	910156E	9101565
200 mm	9101521	9101522	910152E	9101525
250 mm	9101571	9101572	910157E	9101575

Ultra Aromax Columns (USP L11)

Chromatographic Properties

Ultra Aromax is a unique reversed-phase material that exhibits extreme retention and selectivity for aromatic and/or unsaturated compounds. This column is a great alternative to our Biphenyl phase when increased retention is required, and it's an excellent choice for gradient LC-MS analyses when conventional columns are not giving adequate retention or selectivity.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
3 µm Columns				
30 mm	9127331	9127332	912733E	9127335
50 mm	9127351	9127352	912735E	9127355
100 mm	9127311	9127312	912731E	9127315
150 mm	9127361	9127362	912736E	9127365
5 µm Columns				
30 mm	9127531	9127532	912753E	9127535
50 mm	9127551	9127552	912755E	9127555
100 mm	9127511	9127512	912751E	9127515
150 mm	9127561	9127562	912756E	9127565
200 mm	9127521	9127522	912752E	9127525
250 mm	9127571	9127572	912757E	9127575



Aromax

Column Characteristics:

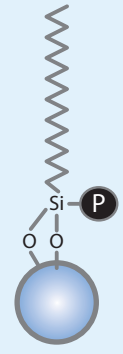
particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	17%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L11
phase category:	phenyl
ligand type:	proprietary phenyl ligand

Ultra Aqueous C18 Columns (USP L1)

Chromatographic Properties

The Restek Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multi-component LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous and acidic. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
3 µm Columns				
30 mm	9178331	9178332	917833E	9178335
50 mm	9178351	9178352	917835E	9178355
100 mm	9178311	9178312	917831E	9178315
150 mm	9178361	9178362	917836E	9178365
5 µm Columns				
30 mm	9178531	9178532	917853E	9178535
50 mm	9178551	9178552	917855E	9178555
100 mm	9178511	9178512	917851E	9178515
150 mm	9178561	9178562	917856E	9178565
200 mm	9178521	9178522	917852E	9178525
250 mm	9178571	9178572	917857E	9178575

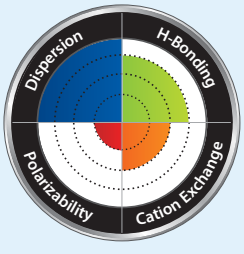


Aqueous C18

Column Characteristics:

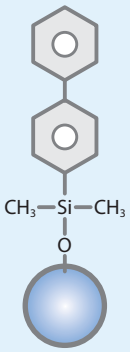
particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18

USLC® Column Interaction Profile
(See page 138 for more information.)



Column Characteristics:

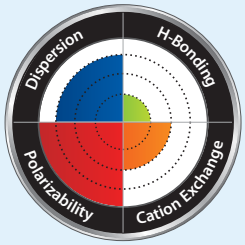
particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl



Biphenyl

USLC® Column Interaction Profile

(See page 138 for more information.)



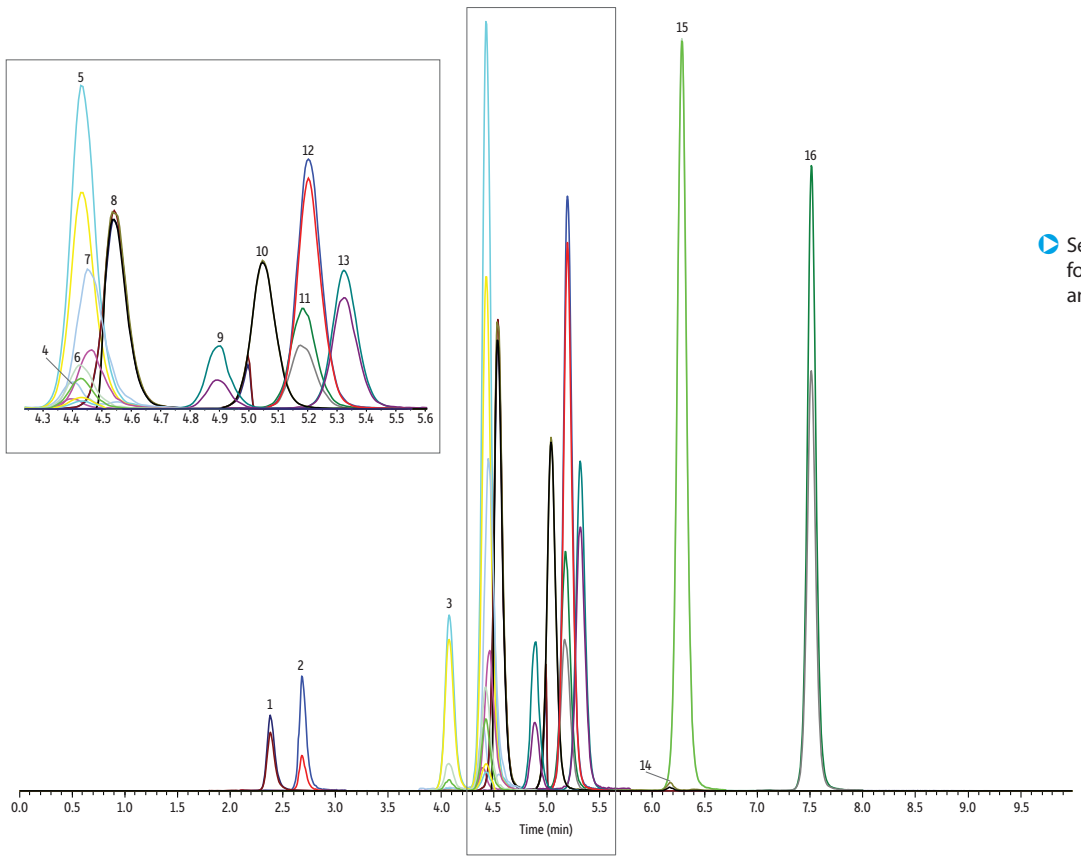
Ultra Biphenyl Columns (USP L11)

Chromatographic Properties

The Restek Biphenyl offers a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	cat.#	cat.#	cat.#	cat.#
3 µm Columns				
30 mm	9109331	9109332	910933E	9109335
50 mm	9109351	9109352	910935E	9109355
100 mm	9109311	9109312	910931E	9109315
150 mm	9109361	9109362	910936E	9109365
5 µm Columns				
30 mm	9109531	9109532	910953E	9109535
50 mm	9109551	9109552	910955E	9109555
100 mm	9109511	9109512	910951E	9109515
150 mm	9109561	9109562	910956E	9109565
200 mm	9109521	9109522	910952E	9109525
250 mm	9109571	9109572	910957E	9109575

Steroid Panel Analysis on the Ultra Biphenyl



See **page 698** for conditions and peak list.

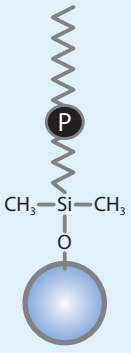
LC_CF0537

Ultra IBD Columns (USP L68)

Chromatographic Properties

The Restek IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
3 µm Columns				
30 mm	9175331	9175332	917533E	9175335
50 mm	9175351	9175352	917535E	9175355
100 mm	9175311	9175312	917531E	9175315
150 mm	9175361	9175362	917536E	9175365
5 µm Columns				
30 mm	9175531	9175532	917553E	9175535
50 mm	9175551	9175552	917555E	9175555
100 mm	9175511	9175512	917551E	9175515
150 mm	9175561	9175562	917556E	9175565
200 mm	9175521	9175522	917552E	9175525
250 mm	9175571	9175572	917557E	9175575

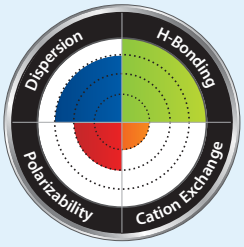


Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar-embedded alkyl
ligand type:	proprietary polar functional embedded alkyl

IBD

USLC® Column Interaction Profile
(See page 138 for more information.)

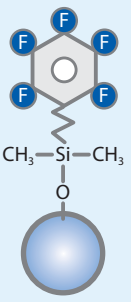


Ultra PFP Propyl Columns (USP L43)

Chromatographic Properties

The Restek PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, however, the Restek PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
3 µm Columns				
30 mm	9179331	9179332	917933E	9179335
50 mm	9179351	9179352	917935E	9179355
100 mm	9179311	9179312	917931E	9179315
150 mm	9179361	9179362	917936E	9179365
5 µm Columns				
30 mm	9179531	9179532	917953E	9179535
50 mm	9179551	9179552	917955E	9179555
100 mm	9179511	9179512	917951E	9179515
150 mm	9179561	9179562	917956E	9179565
200 mm	9179521	9179522	917952E	9179525
250 mm	9179571	9179572	917957E	9179575

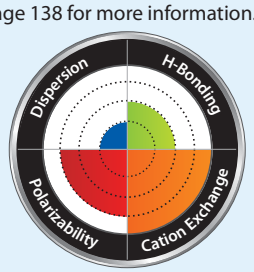


Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl

PFP Propyl

USLC® Column Interaction Profile
(See page 138 for more information.)



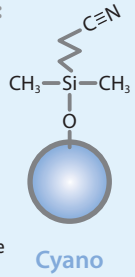
Ultra Cyano Columns (USP L10)

Chromatographic Properties

The Restek Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropylsilane



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9106331	9106332	910633E	9106335
50 mm	9106351	9106352	910635E	9106355
100 mm	9106311	9106312	910631E	9106315
150 mm	9106361	9106362	910636E	9106365
5 µm Columns				
30 mm	9106531	9106532	910653E	9106535
50 mm	9106551	9106552	910655E	9106555
100 mm	9106511	9106512	910651E	9106515
150 mm	9106561	9106562	910656E	9106565
200 mm	9106521	9106522	910652E	9106525
250 mm	9106571	9106572	910657E	9106575

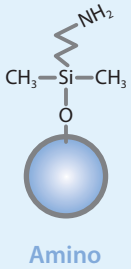
Ultra Amino Columns (USP L8)

Chromatographic Properties

The general-purpose Restek Amino is an aminopropylsilane that offers reproducible retention and efficiency. It is a great choice for the normal-phase or HILIC analysis of simple sugars.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
carbon load:	2%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L8
phase category:	amino
ligand type:	aminopropylsilane



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9107331	9107332	910733E	9107335
50 mm	9107351	9107352	910735E	9107355
100 mm	9107311	9107312	910731E	9107315
150 mm	9107361	9107362	910736E	9107365
5 µm Columns				
30 mm	9107531	9107532	910753E	9107535
50 mm	9107551	9107552	910755E	9107555
100 mm	9107511	9107512	910751E	9107515
150 mm	9107561	9107562	910756E	9107565
200 mm	9107521	9107522	910752E	9107525
250 mm	9107571	9107572	910757E	9107575

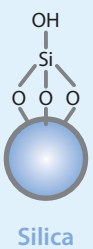
Ultra Silica Columns (USP L3)

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none



Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns				
30 mm	9100331	9100332	910033E	9100335
50 mm	9100351	9100352	910035E	9100355
100 mm	9100311	9100312	910031E	9100315
150 mm	9100361	9100362	910036E	9100365
5 µm Columns				
30 mm	9100531	9100532	910053E	9100535
50 mm	9100551	9100552	910055E	9100555
100 mm	9100511	9100512	910051E	9100515
150 mm	9100561	9100562	910056E	9100565
200 mm	9100521	9100522	910052E	9100525
250 mm	9100571	9100572	910057E	9100575

Viva HPLC Columns: 3 or 5 µm particles; 300 Å pore size

Restek-manufactured silica

- Excellent for separating peptides or proteins.
- Rugged, spherical particles with 300 Å pore size.
- High proportion of pore/surface area available to large molecules.

Viva columns are based on a wide-pore material we designed for optimal large-molecule separations. In developing Viva silica, we found that although many commercial wide-pore silicas meet the standard 300 Å mean pore size, most have very broad distributions about this mean with a significant portion of their pore volume falling below 150 Å. This means a large portion of the surface area is unavailable to larger molecules. Viva columns have a narrow distribution around the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.

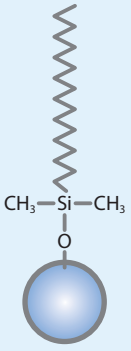
Viva C18 Columns (USP L1)

Restek-manufactured silica

Chromatographic Properties

The general-purpose Restek C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
3 µm Columns				
30 mm	9514331	9514332	951433E	9514335
50 mm	9514351	9514352	951435E	9514355
100 mm	9514311	9514312	951431E	9514315
150 mm	9514361	9514362	951436E	9514365
5 µm Columns				
30 mm	9514531	9514532	951453E	9514535
50 mm	9514551	9514552	951455E	9514555
100 mm	9514511	9514512	951451E	9514515
150 mm	9514561	9514562	951456E	9514565
200 mm	9514521	9514522	951452E	9514525
250 mm	9514571	9514572	951457E	9514575



C18

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	300 Å
carbon load:	9%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18

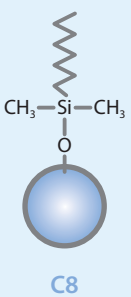
Viva C8 Columns (USP L7)

Restek-manufactured silica

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek C8 is suitable for a wide range of compounds from acidic through slightly basic.

	1.0 mm ID	2.1 mm ID	3.0 mm ID	4.6 mm ID
Length	**cat.#**	**cat.#**	**cat.#**	**cat.#**
5 µm Columns				
30 mm	9513531	9513532	951353E	9513535
50 mm	9513551	9513552	951355E	9513555
100 mm	9513511	9513512	951351E	9513515
150 mm	9513561	9513562	951356E	9513565
200 mm	9513521	9513522	951352E	9513525
250 mm	9513571	9513572	951357E	9513575



C8

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8

Viva C4 Columns (USP L26)

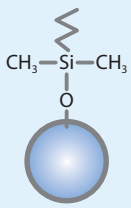
Restek-manufactured silica

Chromatographic Properties

Base-deactivated, wide-pore packing exhibits excellent peak shape for a wide range of compounds. Less retention in reversed-phase assays than Viva C18 or Viva C8.

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	3.5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C



C4

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9512531	9512532	951253E	9512535
50 mm	9512551	9512552	951255E	9512555
100 mm	9512511	9512512	951251E	9512515
150 mm	9512561	9512562	951256E	9512565
200 mm	9512521	9512522	951252E	9512525
250 mm	9512571	9512572	951257E	9512575

Viva Biphenyl Columns (USP L11)

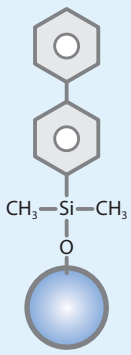
Restek-manufactured silica

Chromatographic Properties

The Restek Biphenyl offers a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	7%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl



Biphenyl

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9516531	9516532	951653E	9516535
50 mm	9516551	9516552	951655E	9516555
100 mm	9516511	9516512	951651E	9516515
150 mm	9516561	9516562	951656E	9516565
200 mm	9516521	9516522	951652E	9516525
250 mm	9516571	9516572	951657E	9516575

Viva PFP Propyl Columns (USP L43)

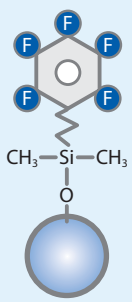
Restek-manufactured silica

Chromatographic Properties

The Restek PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, however, the Restek PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
carbon load:	5%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl



PFP Propyl

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9519531	9519532	951953E	9519535
50 mm	9519551	9519552	951955E	9519555
100 mm	9519511	9519512	951951E	9519515
150 mm	9519561	9519562	951956E	9519565
200 mm	9519521	9519522	951952E	9519525
250 mm	9519571	9519572	951957E	9519575

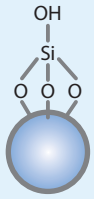
Viva Silica Columns (USP L3)

Restek-manufactured silica

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns				
30 mm	9510531	9510532	951053E	9510535
50 mm	9510551	9510552	951055E	9510555
100 mm	9510511	9510512	951051E	9510515
150 mm	9510561	9510562	951056E	9510565
200 mm	9510521	9510522	951052E	9510525
250 mm	9510571	9510572	951057E	9510575



Silica

Column Characteristics:

particle size:	5 µm, spherical
pore size:	300 Å
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none

Application-Specific LC Phases

Pinnacle® II PAH HPLC Columns

Restek-manufactured silica

Chromatographic Properties

Developed specifically for challenging analyses of polycyclic aromatic hydrocarbons (PAHs). The Pinnacle® II PAH stationary phase incorporates a proprietary C18 bonding that enables unique shape selectivity to baseline resolve all 16 PAHs listed in U.S. EPA Method 610 plus two other routinely analyzed PAH compounds. Every lot of Pinnacle® II PAH bonded phase material is tested to ensure baseline resolution of the Method 610 PAHs using a simple water/acetonitrile mobile phase gradient. Further, because we make Pinnacle® II PAH columns using our own silica, we have greater control over quality and reproducibility. If you are analyzing PAHs using HPLC, Pinnacle® II PAH columns are a reliable, cost-effective choice.

Column Characteristics:

particle size:	4 µm, spherical
pore size:	110 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

Length	2.1 mm ID cat.#	3.0 mm ID cat.#	4.6 mm ID cat.#
4 µm Columns			
50 mm	9219452	921945E	9219455
100 mm	9219412	921941E	9219415
150 mm	9219462	921946E	9219465
200 mm	9219422	921942E	9219425
250 mm	9219472	921947E	9219475

Pinnacle® II PAH Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Pinnacle II PAH Guard Cartridge	921950212	921950210

Pinnacle® DB PAH UHPLC Columns

Restek-manufactured silica

Chromatographic Properties

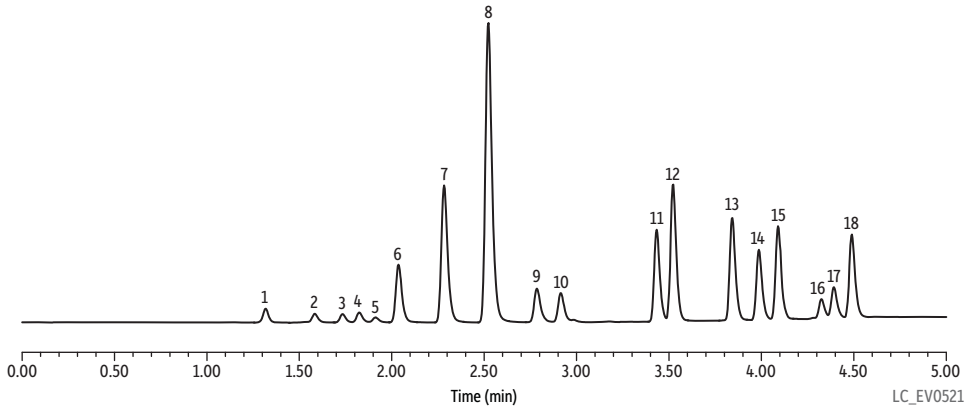
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons (PAHs). Get complete resolution of all 16 EPA 610 PAHs plus two other routinely analyzed PAH compounds in less than five minutes to greatly reduce run times and increase sample throughput.

	2.1 mm ID
Length	**cat.#**
1.9 µm Columns	
30 mm	9470232
50 mm	9470252
100 mm	9470212

Column Characteristics:

particle size:	1.9 µm, spherical
pore size:	140 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

PAH Mix on Pinnacle® DB PAH



Peaks
1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

Column	Pinnacle® DB PAH (cat.# 9470252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	EPA Method 8310 PAH Mixture (cat.# 31841)
Diluent:	acetonitrile
Conc.:	10 µg/mL
Inj. Vol.:	1 µL
Mobile Phase	
A:	water
B:	acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0	0.8	60	40
2	0.8	40	60
4	0.8	0	100
4.5	0.8	0	100
4.51	0.8	60	40
5	0.8	60	40

Max Pressure:	724 bar
Detector	Photo diode array @ 254, 4.8 nm
Instrument	Waters

Allure® AK Columns

Chromatographic Properties

This highly retentive, highly selective phase—unique to Restek—was developed specifically for the analysis of aldehydes and ketones as DNPH derivatives. Allure® AK is a reversed-phase HPLC material that has the unique ability to separate all 13 carbonyl compounds specified in California Air Resources Board (CARB) Method #1004, using a simple acetonitrile/water gradient. Other columns require long analysis times or the use of tetrahydrofuran.

Column Characteristics:

particle size:	5 µm, spherical
pore size:	60 Å
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C

Length	3.2 mm ID cat.#	4.6 mm ID cat.#
5 µm Columns with Trident Integral Inlet Fittings		
200 mm	9159523-700	9159525-700

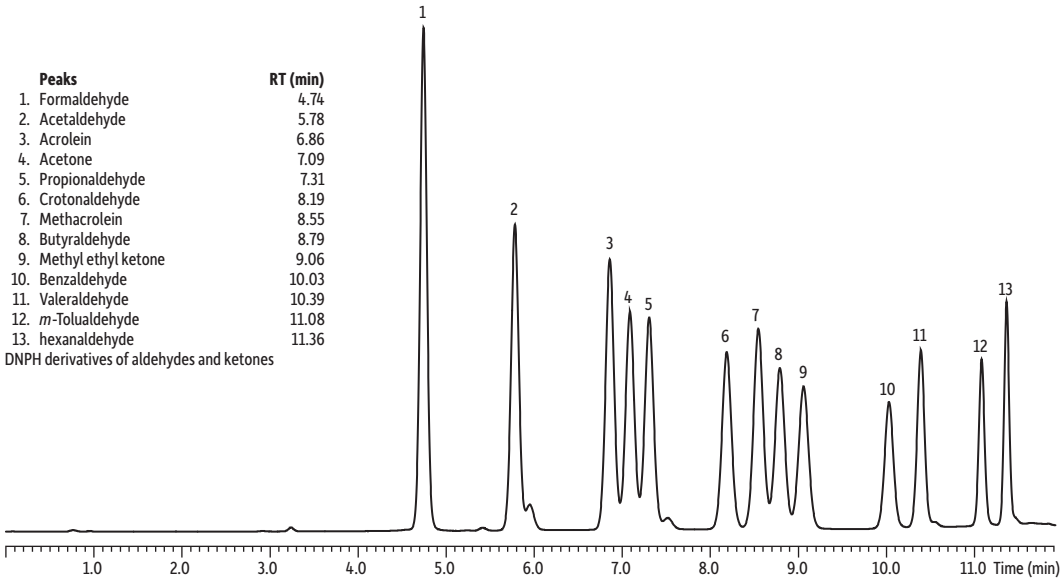
Allure® AK Guard Cartridge

Guard Cartridges	3-pk. (10 x 4.0 mm)
Allure AK Guard Cartridge	915950210

Carbonyls by CARB Method 1004 on Allure® AK

Peaks	RT (min)
1. Formaldehyde	4.74
2. Acetaldehyde	5.78
3. Acrolein	6.86
4. Acetone	7.09
5. Propionaldehyde	7.31
6. Crotonaldehyde	8.19
7. Methacrolein	8.55
8. Butyraldehyde	8.79
9. Methyl ethyl ketone	9.06
10. Benzaldehyde	10.03
11. Valeraldehyde	10.39
12. *m*-Tolualdehyde	11.08
13. hexanaldehyde	11.36

DNPH derivatives of aldehydes and ketones



LC_EV0393

Column	Allure® AK (cat.# 9159525-700)
Dimensions:	200 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	60 Å
Temp.:	30 °C
Sample	dinitrophenylhydrazine (DNPH) derivatives of aldehydes/ketones
Diluent:	acetonitrile
Conc.:	3 µg/mL each analyte, as aldehyde/ketone
Inj. Vol.:	10 µL
Mobile Phase	
A:	water
B:	acetonitrile

Time (min)	%B
0	60
8	70
10	100

Flow:	1.5 mL/min
Detector	UV/Vis @ 360 nm

Allure® Organic Acids Columns

Chromatographic Properties

Allure® Organic Acids columns provide enhanced retention and selectivity for polar organic acids, allowing the separation to be performed on a single 30 cm column. An Allure® Organic Acids column effectively resolves key organic acids such as tartaric and quinic acids using the chromatographic conditions specified in AOAC method 986.13. Retention is stable and reproducible, even with the 100% aqueous mobile phase specified in the AOAC method.

Column Characteristics:

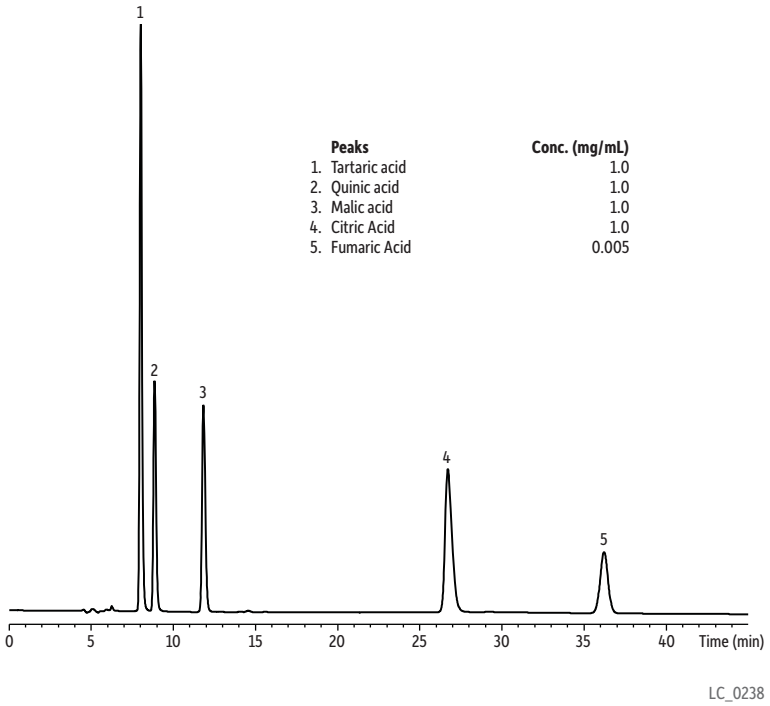
particle size:	5 µm, spherical
pore size:	60 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C

Length	3.0 mm ID cat.#	4.6 mm ID cat.#
5 µm Column		
150 mm	916556E	9165565
250 mm		9165575
300 mm		9165585

Allure® Organic Acids Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Allure Organic Acids Guard Cartridge	916550212	916550210

Organic Acids on Allure® Organic Acids



Peaks	Conc. (mg/mL)
1. Tartaric acid	1.0
2. Quinic acid	1.0
3. Malic acid	1.0
4. Citric Acid	1.0
5. Fumaric Acid	0.005

LC_0238

Column	Allure® Organic Acids (cat.# 9165585)
Dimensions:	300 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	60 Å
Temp.:	ambient
Sample	standard solution
Diluent:	water
Inj. Vol.:	10.0 µL
Mobile Phase	100 mM phosphate buffer, pH 2.5
Flow:	0.5 mL/min
Detector	UV/Vis @ 226 nm

Ultra Carbamate Columns

Chromatographic Properties

Restek chemists developed the Ultra Carbamate column specifically for carbamates analysis. The unique packing separates 10 target carbamates in just over 10 minutes. The column is compatible with fluorescence or LC-MS detection.* An Ultra Carbamate column can process as many as three samples per hour, versus less than two samples per hour on a general-purpose C18 column. In addition to increased sample throughput, this much faster analysis will significantly reduce solvent usage—and the costs of disposing of solvent waste.

Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
pH range:	2.5 to 8
temperature limit:	80 °C

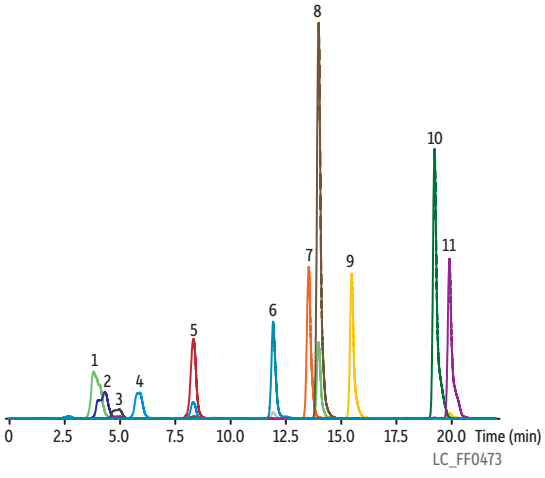
Length	1.0 mm ID cat.#	2.1 mm ID cat.#	3.0 mm ID cat.#	4.0 mm ID cat.#	4.6 mm ID cat.#
3 µm Columns					
50 mm	9177351	9177352	917735E	9177354	9177355
100 mm	9177311	9177312	917731E		9177315
5 µm Columns					
250 mm					9177575

*For post-column derivatization/fluorescence detection applications using a 4.6 mm ID column, the total system dead volume, including the post-column reactor, must be less than 650 µL. For standard post-column reactor systems, we recommend a 250 mm x 4.6 mm, 5 µm column. Contact Restek Technical Service or your local Restek representative for more information.

Ultra Carbamate Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Ultra Carbamate Guard Cartridge	917750212	917750210

Carbamates on Ultra Carbamate



Peaks
1. Aldicarb sulfone
2. Aldicarb sulfoxide
3. Oxamyl
4. Methomyl
5. 3-Hydroxycarbofuran
6. Aldicarb
7. Propoxur
8. Carbofurane
9. Carbaryl
10. Methiocarb
11. BDMC (IS)

Column	Ultra Carbamate (cat.# 9177352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	531.1 Carbamate Pesticide Calibration Mixture (cat.# 32273) 4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC) (cat.# 32274)
Diluent:	methanol
Conc.:	50 µg/mL
Inj. Vol.:	1 µL
Mobile Phase	
A:	2 mM ammonium acetate:methanol (v/v, 90/10)
B:	2 mM ammonium acetate:methanol (v/v, 10/90)

Time (min)	%A	%B
0.00	80	20
20	0	100
25	0	100

Flow:	0.2 mL/min
Detector	LECO Unique® TOFMS
Run Length:	25 min
Ionization Source Type:	high flow ESI
Ion Mode:	positive
Desolvation Temp.:	130 °C
Nebulizing Pressure:	100 kPa
Desolvation Gas (N2):	4 L/min
Interface Temp.:	120 °C
Nozzle Voltage:	62 V
Capillary Voltage:	2.75 kV
Instrument	Agilent 1100
Acknowledgement	LECO Corporation

Ultra Quat Columns

Chromatographic Properties

A retentive, high-purity, base-deactivated, reversed-phase packing. Ideal for the analysis of paraquat and diquat or other quaternary amines.

Length	2.1 mm ID cat.#	4.6 mm ID cat.#
3 µm Column		
50 mm	9181352	
5 µm Column		
150 mm		9181565

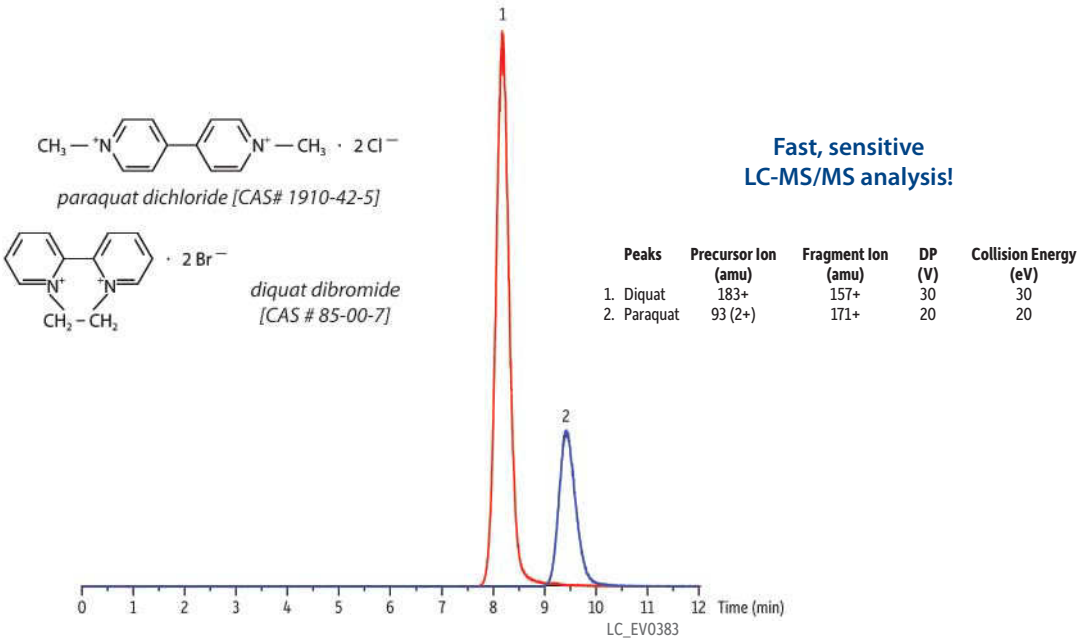
Column Characteristics:

particle size:	3 µm or 5 µm, spherical
pore size:	100 Å
pH range:	2.5 to 8
temperature limit:	80 °C

Ultra Quat Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Ultra Quat Guard Cartridge	918150212	918150210

Paraquat and Diquat on Ultra Quat



paraquat dichloride [CAS# 1910-42-5]

diquat dibromide [CAS # 85-00-7]

Fast, sensitive LC-MS/MS analysis!

Peaks	Precursor Ion (amu)	Fragment Ion (amu)	DP (V)	Collision Energy (eV)
1. Diquat	183+	157+	30	30
2. Paraquat	93 (2+)	171+	20	20

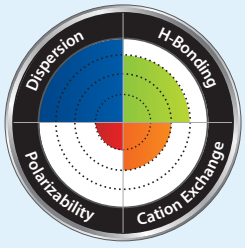
Column	Ultra Quat (cat.# 9181352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	DI Water
Conc.:	5 µg/mL each component
Inj. Vol.:	10 µL
Mobile Phase	10 mM heptafluorobutyric acid:acetonitrile (95:5)
Flow:	0.3 mL/min
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	API 3200™ MS/MS system
Ion Source:	Electrospray
Ion Mode:	ESI+
Ion Spray Voltage:	5.5 kV
Curtain Gas:	15 psi (103.4 kPa)
Gas 1:	70 psi (482.6 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	600 °C
Mode:	MRM
Dwell Time:	200 ms
Instrument	Applied Biosystems/MDS Sciex LC-MS/MS System
Notes	Collision exit potential: 3V Q1/Q3: unit resolution
Acknowledgement	Data courtesy of Houssain El Aribi, Ph.D., LC/MS Product and Application Specialist, MDS SCIEX, 71 Four Valley Drive, Concord, Ontario, Canada, L4K 4V8

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	modified C18
ligand type:	proprietary polar modified and functionally bonded C18

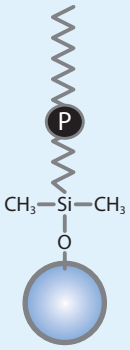
Aqueous C18

USLC® Column Interaction Profile
(See page 138 for more information.)



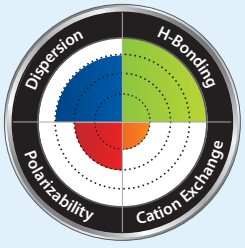
Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L68
phase category:	polar-embedded alkyl
ligand type:	proprietary polar functional embedded alkyl



IBD

USLC® Column Interaction Profile
(See page 138 for more information.)



Ultra Preparative Columns

Using Restek Ultra columns for preparative applications can save you time, solvents, and money. By utilizing the right phase for your prep analysis, you can make sure your peaks are resolved and your compounds are pure. The Ultra line has high loading and features high-purity silica.

USLC® Phases for Preparative HPLC

Ultra Aqueous C18 HPLC Prep Columns

Chromatographic Properties

The Restek Aqueous C18 is a rugged, reversed-phase column with a well-balanced retention profile. It can effectively retain more types of solutes than a conventional C18 and is ideal for multi-component LC-MS analyses. The general-purpose Aqueous C18 boasts high reproducibility and compatibility with many mobile phase conditions—even 100% aqueous and acidic. And when used with a gradient, it eliminates the all-too-common issue of multiple compounds eluting near the column void time.

	10 mm ID	21.2 mm ID	30 mm ID
Length	cat.#	cat.#	cat.#
5 µm Columns			
50 mm	9178557	9178558	9178559
100 mm	9178517	9178518	9178519
150 mm	9178567	9178568	9178569
250 mm	9178577	9178578	9178579

Ultra IBD HPLC Prep Columns

Chromatographic Properties

The Restek IBD is a polar-embedded column that acts as a strong hydrogen bonder and may be the most versatile column available today. With a unique polar group, this column is very retentive and selective for acids. It also provides symmetrical peak shape for strong bases. Restek's IBD is compatible with 100% aqueous mobile phases and can be used under reversed-phase or HILIC conditions to retain very polar, ionic compounds in highly organic mobile phases.

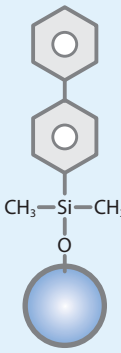
	10 mm ID	21.2 mm ID	30 mm ID
Length	cat.#	cat.#	cat.#
5 µm Columns			
50 mm	9175557	9175558	9175559
100 mm	9175517	9175518	9175519
150 mm	9175567	9175568	9175569
250 mm	9175577	9175578	9175579

Ultra Biphenyl Prep Columns

Chromatographic Properties

The Restek Biphenyl offers a greater degree of dispersion than conventional phenyls and a greater degree of polarizability than phenyl hexyls, creating higher selectivity and a greater range of usability. Because of these heightened interactions, this column shows substantial increases in retention—especially for dipolar, unsaturated, or conjugated solutes—and enhanced orthogonal selectivity when using methanol mobile phases. It is ideal for increasing sensitivity and selectivity in LC-MS analyses.

	10 mm ID	21.2 mm ID	30 mm ID
Length	cat.#	cat.#	cat.#
5 µm Columns			
50 mm	9109557	9109558	9109559
100 mm	9109517	9109518	9109519
150 mm	9109567	9109568	9109569
250 mm	9109577	9109578	9109579

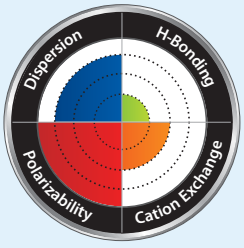


Biphenyl

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	15%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase:	L11
phase category:	phenyl
ligand type:	unique Biphenyl

USLC® Column Interaction Profile
(See page 138 for more information.)

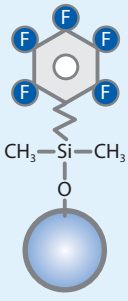


Ultra PFP Propyl Prep Columns

Chromatographic Properties

The Restek PFP Propyl is a great choice for the retention and selectivity of charged bases, electronegative compounds, and amine-containing compounds. Unlike a conventional cyano column, however, the Restek PFP Propyl is much more amenable to LC-MS because it is more reliable and efficient with acidic mobile phases. This versatile column is also compatible with highly aqueous mobile phases and HILIC separations.

	10 mm ID	21.2 mm ID	30 mm ID
Length	cat.#	cat.#	cat.#
5 µm Columns			
50 mm	9179557	9179558	9179559
100 mm	9179517	9179518	9179519
150 mm	9179567	9179568	9179569
250 mm	9179577	9179578	9179579

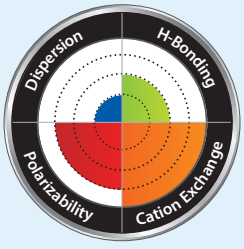


PFP Propyl

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	11%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L43
phase category:	fluorophenyl propyl
ligand type:	pentafluorophenyl propyl

USLC® Column Interaction Profile
(See page 138 for more information.)



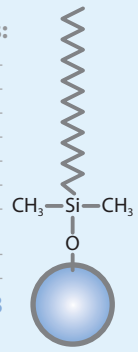
Before You Buy a Prep Column...

PLEASE NOTE: We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns.

Traditional Phases for Preparative HPLC

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	20%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L1
phase category:	C18, octadecylsilane
ligand type:	monomeric C18



C18

Ultra C18 HPLC Prep Columns

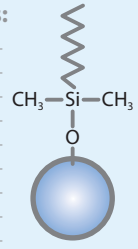
Chromatographic Properties

The general-purpose Restek C18 is a conventional monomeric octadecylsilane column suitable for analyses of a wide range of compounds from acidic through slightly basic.

	10 mm ID	21.2 mm ID	30 mm ID
Length	cat.#	cat.#	cat.#
5 µm Columns			
50 mm	9174557	9174558	9174559
100 mm	9174517	9174518	9174519
150 mm	9174567	9174568	9174569
250 mm	9174577	9174578	9174579

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	12%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L7
phase category:	C8, octylsilane
ligand type:	monomeric C8



C8

Ultra C8 HPLC Prep Columns

Chromatographic Properties

Our C8 is a conventional monomeric octylsilane column offering a shorter alkyl chain to provide less hydrophobic retention and improved basic peak shape over a traditional C18 phase. Like our C18, this general-purpose Restek C8 is suitable for a wide range of compounds from acidic through slightly basic.

	10 mm ID	21.2 mm ID	30 mm ID
Length	cat.#	cat.#	cat.#
5 µm Columns			
50 mm	9103557	9103558	9103559
100 mm	9103517	9103518	9103519
150 mm	9103567	9103568	9103569
250 mm	9103577	9103578	9103579

Before You Buy a Prep Column...

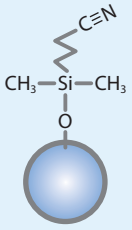
PLEASE NOTE: We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns.

Ultra Cyano HPLC Prep Columns

Chromatographic Properties

The Restek Cyano is a traditional monomeric cyanopropylsilane that is recommended for assays where alternate selectivity, or confirmation, to a C18 or C8 column is desired. It can be used in normal-phase, reversed-phase (best with mobile phase pH between 5 and 7), and HILIC modes. It is an excellent choice for the analysis of protonated bases.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
5 µm Columns			
50 mm	9106557	9106558	9106559
100 mm	9106517	9106518	9106519
150 mm	9106567	9106568	9106569
250 mm	9106577	9106578	9106579



Cyano

Column Characteristics:

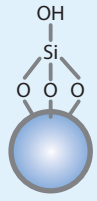
particle size:	5 µm, spherical
pore size:	100 Å
carbon load:	8%
end-cap:	yes
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L10
phase category:	cyano
ligand type:	cyanopropylsilane

Ultra Silica HPLC Prep Columns

Chromatographic Properties

Base-deactivated spherical silica is useful for normal-phase or HILIC separations.

Length	10 mm ID cat.#	21.2 mm ID cat.#	30 mm ID cat.#
5 µm Columns			
50 mm	9100557	9100558	9100559
100 mm	9100517	9100518	9100519
150 mm	9100567	9100568	9100569
250 mm	9100577	9100578	9100579



Silica

Column Characteristics:

particle size:	5 µm, spherical
pore size:	100 Å
end-cap:	no
pH range:	2.5 to 8
temperature limit:	80 °C
USP phase code:	L3
phase category:	bare silica
ligand type:	none

Ultra Bulk Packing Materials (5 µm)

Use our bulk packing materials to pack your own columns!

- Prepare your own columns in conventional or custom dimensions.
- Consistent, high-quality materials.

Our extensive QC program ensures the high quality and reproducibility of these silicas. You can be confident that you are getting consistent, high-quality product when you source your silica from Restek.

Use these materials for easy scale-up to preparative chromatography or for packing your own columns.

Description	qty.	cat.#
5 µm Ultra Bulk Packing Materials		
Ultra C1 Bulk Packing	10 g/btl.	91015
Ultra C4 Bulk Packing	10 g/btl.	91025
Ultra C8 Bulk Packing	10 g/btl.	91035
Ultra C18 Bulk Packing	10 g/btl.	91745
Ultra Amino Bulk Packing	10 g/btl.	91075
Ultra Cyano Bulk Packing	10 g/btl.	91065
Ultra Silica Bulk Packing	10 g/btl.	91005

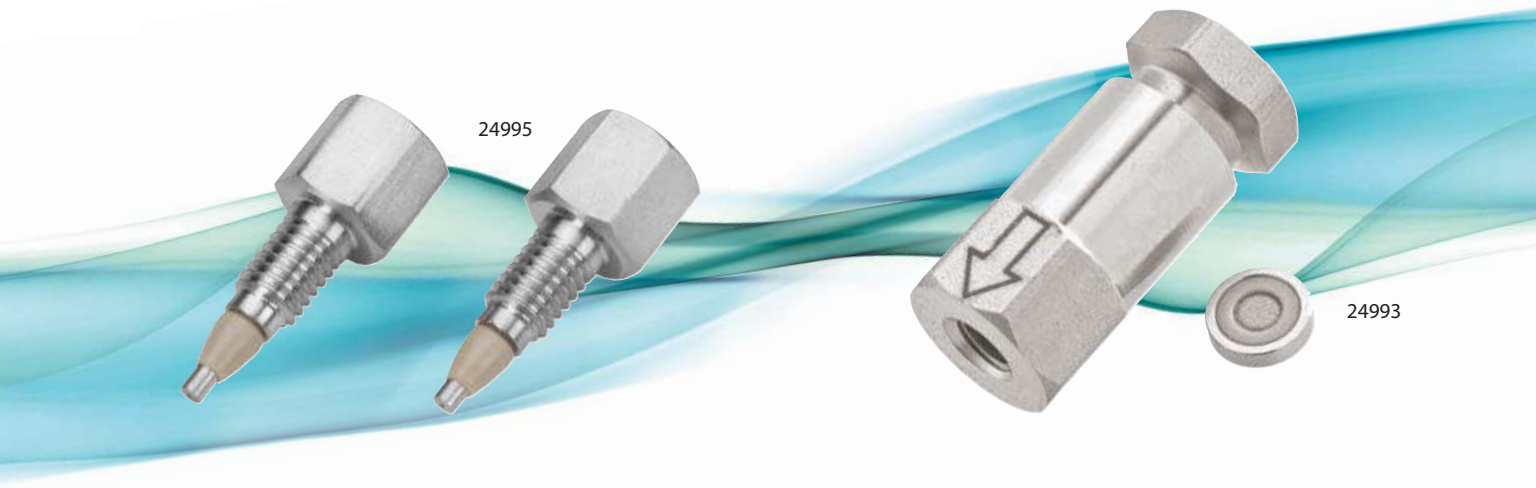
also available

Other stationary phases and particle sizes are also available in bulk; call Customer Service or your local Restek representative for details.

Protect Your Column and Your UHPLC Performance With UltraShield and UltraLine UHPLC Filters

A cost-effective way to extend the lifetime of any UHPLC column without sacrificing your UHPLC performance on any LC system

Use with any UHPLC system



UltraShield UHPLC PreColumn Filter

- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Universal fit—connects easily to any brand column.
- Leak-tight to 15,000 psi (1,034 bar).
- 0.5 µm titanium filter in stainless steel body with PEEK ferrule.

Specifications:

Inlet/Outlet:	Female/Male 10-32
Port Geometry:	Parker ($^1/_{16}$ CPI)
Material:	Stainless steel, PEEK ferrule
Filter:	0.5 µm titanium
Pressure Rating:	15,000 psig (1,034 bar)
Wrench Flat:	$^5/_{16}$"

Description	qty.	cat.#
UltraShield UHPLC PreColumn Filter	ea.	24995
UltraShield UHPLC PreColumn Filter	5-pk.	24996
UltraShield UHPLC PreColumn Filter	10-pk.	24997

UltraLine UHPLC In-Line Filter

- In-line design installs easily with standard fittings.
- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Leak-tight to 15,000 psi (1,034 bar).
- Replaceable 0.5 µm stainless steel filter in stainless steel body.

Specifications:

Inlet/Outlet:	Female/Female 10-32
Port Geometry:	Parker ($^1/_{16}$ CPI)
Material:	Stainless steel housing
Filter:	0.5 µm stainless steel, 0.125" W x 0.062" T, 5 µL volume
Pressure Rating:	15,000 psig (1,034 bar)
Wrench Flat:	$^3/_8$"

Description	qty.	cat.#
UltraLine UHPLC In-Line Filter (In-Line Assembly with Filter)	ea.	24993
UltraLine Replacement Filters	5-pk.	24994

Trident Direct Guard Cartridge System Easy to Use, Low Dead Volume—
The Ultimate Combination of Convenience and Column Protection

Unlike "one size fits all" guard systems, the Trident direct system gives you the power to select the right level of protection for your analysis. The system offers three levels of protection and guard cartridges in four dimensions, with a variety of bonded phases to match your analytical column. The economical, leak-free cartridge design provides an unprecedented combination of convenience, economy, and reliability. The foundation of the Trident direct system is a reusable direct connect holder that easily attaches to any HPLC column using CPI- or Waters-style end fittings.* The system is available in configurations to match different protection levels: in-line filter, in-line filter with holder for 10 mm guard cartridge. The guard cartridges are available in 2.1 and 4.0 mm ID and are interchangeable within the appropriate length holder.

25082
Protection against particulate matter.

25084
Protection against particulate matter and moderate protection against irreversibly adsorbed compounds.

Description	qty.	cat.#
High-pressure filter	ea.	25082
10 mm guard cartridge holder without filter	ea.	25083
10 mm guard cartridge holder with filter	ea.	25084
PEEK tip for Waters-style end fittings	ea.	25088
PEEK tip for standard fittings	ea.	25087

*The standard PEEK tip in Trident direct systems is compatible with Parker, Upchurch Scientific, Valco, and other CPI-style fittings. To use Trident direct systems with Waters-style end fittings, replace the tip with cat.# 25088.

Trident direct 10 mm guard cartridge holder with filter

Components

Assembled

Installed onto column

Double the Protection With Cap Frits!

Replacement Cap Frits

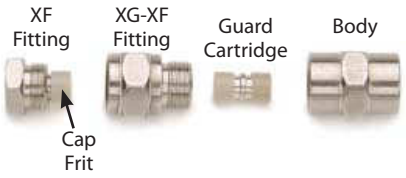
Replacement guard cartridges can cost as much as an analytical column, so why not protect them, too? The removable cap frit in a Trident direct helps prevent clogged cartridges to extend the life of your column, your cartridge, and your budget!

Description	ID	Porosity	qty.	cat.#
Replacement Cap Frits	4 mm	2.0 µm	5-pk.	25022
Replacement Cap Frits	4 mm	0.5 µm	5-pk.	25023
Replacement Cap Frits	2 mm	2.0 µm	5-pk.	25057
Replacement Cap Frits	2 mm	0.5 µm	5-pk.	25990

25022

Trident in-line 10 mm guard cartridge holder with filter

Components



Assembled

Installed onto column

Trident HPLC In-Line Guard Cartridge Holders

A Trident in-line guard cartridge holder can be used with almost any HPLC column by connecting it with a short piece of 1/16" tubing, appropriate nuts and ferrules, or finger-tight fittings. The system can be used with Restek columns, or with columns from other manufacturers. Holders are available for either 10 mm or 20 mm guard cartridges. Either size can be purchased with or without a prefilter, which provides added protection against the particles that can shorten the lifetime of the guard cartridge.

25021

25040

Description	qty.	cat.#
Holder for 10 mm guard cartridge	ea.	25021
Holder with filter for 10 mm guard cartridge	ea.	25040
Frit-Type In-Line Filter, 2.0 µm	ea.	25041

For HPLC tubing, visit **www.restek.com/lcacc**

NEW!

25940

EXP® Reusable Fittings for HPLC & UHPLC for 10-32 fittings and 1/16" tubing

EXP® Hand-Tight Coupler

Description	qty.	cat.#
EXP Hand-Tight Coupler (2 Nuts, 2 Ferrules, 1/16" x 0.005" ID Tubing)	ea.	25940

Hybrid Ferrule U.S. Patent No. 8201854, Optimize Technologies. Optimize Technologies EXP Holders are Patent Pending. Other U.S. and Foreign Patents Pending. The Opti- prefix is a registered trademark of Optimize Technologies, Inc.

also available

Our entire EXP® fitting selection.

See page 313.

Double the Protection With Cap Frits!

Replacement Cap Frits

Replacement guard cartridges can cost as much as an analytical column, so why not protect them, too? The removable cap frit in a Trident direct helps prevent clogged cartridges to extend the life of your column, your cartridge, and your budget!

25057

Description	ID	Porosity	qty.	cat.#
Replacement Cap Frits	4 mm	2.0 µm	5-pk.	25022
Replacement Cap Frits	4 mm	0.5 µm	5-pk.	25023
Replacement Cap Frits	2 mm	2.0 µm	5-pk.	25057
Replacement Cap Frits	2 mm	0.5 µm	5-pk.	25990

Trident HPLC Guard Cartridges

Description	3-pk. (10 x 2.1 mm)	3-pk. (10 x 4.0 mm)
Pinnacle DB Guard Cartridges		
Pinnacle DB C18 Guard Cartridge	941450212	941450210
Pinnacle DB C8 Guard Cartridge	941350212	941350210
Pinnacle DB Aqueous C18 Guard Cartridge	941850212	941850210
Pinnacle DB Biphenyl Guard Cartridge	940950212	940950210
Pinnacle DB PFP Propyl Guard Cartridge	941950212	941950210
Pinnacle DB Cyano Guard Cartridge	941650212	941650210
Pinnacle DB Silica Guard Cartridge	941050212	941050210
Ultra Guard Cartridges		
Ultra C18 Guard Cartridge	917450212	917450210
Ultra C8 Guard Cartridge	910350212	910350210
Ultra C4 Guard Cartridge	910250212	910250210
Ultra C1 Guard Cartridge	910150212	910150210
Ultra Aromax Guard Cartridge	912750212	912750210
Ultra Aqueous C18 Guard Cartridge	917850212	917850210
Ultra Biphenyl Guard Cartridge	910950212	910950210
Ultra IBD Guard Cartridge	917550212	917550210
Ultra PFP Guard Cartridge	917650212	917650210
Ultra Cyano Guard Cartridge	910650212	910650210
Ultra Amino Guard Cartridge	910750212	910750210
Ultra Silica Guard Cartridge	910050212	910050210
Viva Guard Cartridges		
Viva C18 Guard Cartridge	951450212	951450210
Viva C8 Guard Cartridge	951350212	951350210
Viva C4 Guard Cartridge	951250212	951250210
Viva Biphenyl Guard Cartridge	951650212	951650210
Viva PFP Propyl Guard Cartridge	951950212	951950210
Viva Silica Guard Cartridge	951050212	951050210

Guard Cartridge


RESTEK

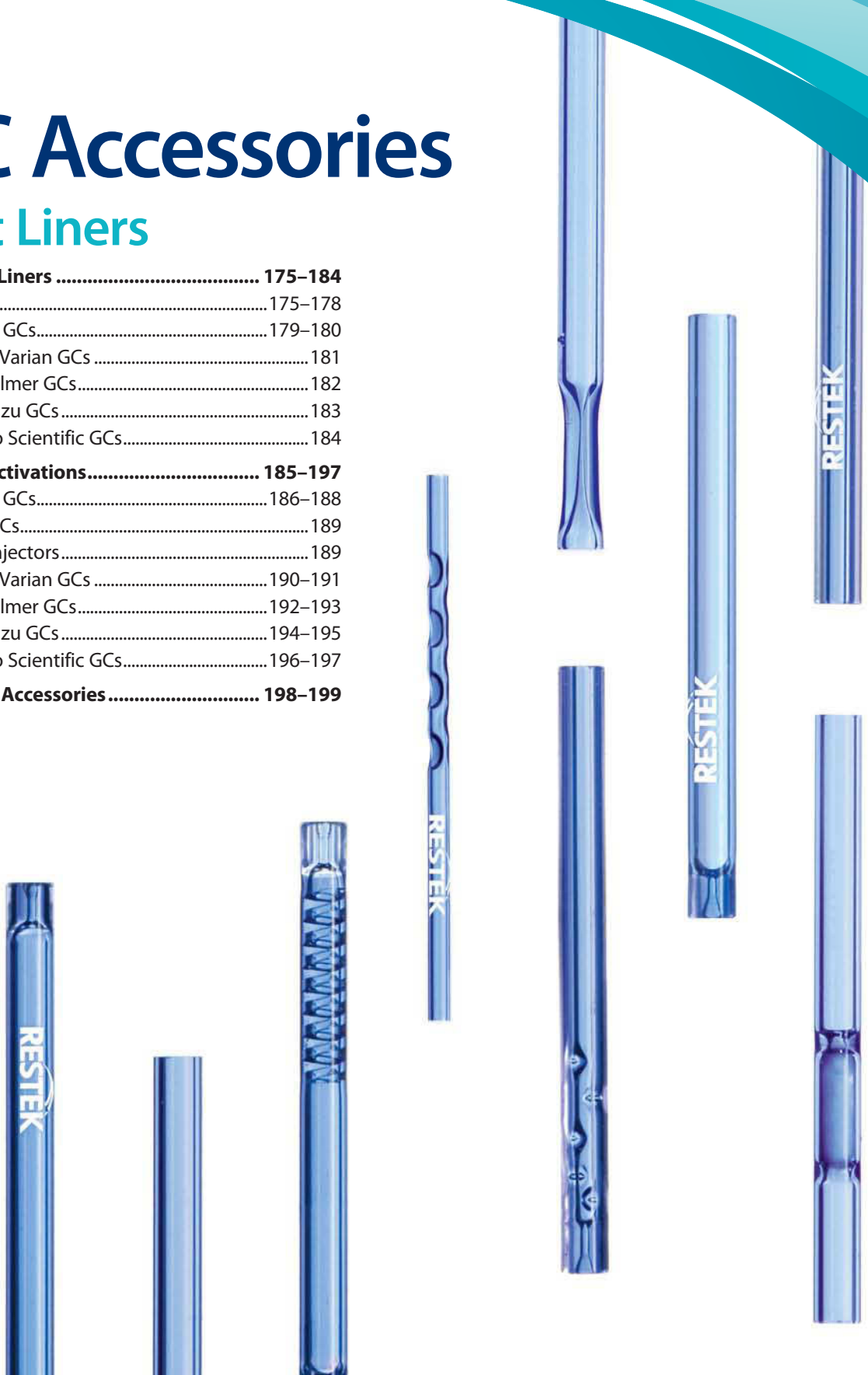
Supplies & Accessories

GC Accessories

LC Accessories

GC Accessories

Inlet Liners



Sky® Inlet Liners

Patent pending

True Blue Performance

- Increase accuracy and reproducibility with state-of-the-art deactivation.
- Achieve lower detection limits for a wide range of active compounds.
- Use wool with confidence—quartz wool is deactivated after packing, preventing the loss of sensitive analytes.

Sky® liners give you the inertness you need for more accurate trace-level results.

When faced with complex choices, simple solutions stand out. Sky® inlet liners from Restek use a comprehensive, state-of-the-art deactivation and are the only blue liners on the market—making them an easy-to-recognize solution to common inlet problems.

The innovative deactivation used for Sky® liners results in exceptional inertness for a wide range of analyte chemistries. By reducing active sites and enhancing analyte transfer to the column, these liners increase accuracy and precision, allowing lower detection limits for many active compounds. In addition to improved data quality, you'll benefit from fewer liner changes and less downtime for maintenance.

Selecting the right liner for your application can be a challenging task. Sky® inlet liners make the choice simple; the comprehensive deactivation, distinctive color, and availability in popular configurations mean Sky® liners are the best choice for optimizing chromatographic performance. Regardless of your application, Sky® liners provide reliable inertness and assured performance, day-after-day and analysis-after-analysis.

The Story Behind Sky® Liners

For over 25 years, Restek's vision has been to be the company chromatographers trust. This philosophy is the cornerstone of our business, and it's the reason our chemists and engineers are dedicated to developing innovative, best-in-class products like Sky® liners. As chromatographers, we understand your needs and strive to develop and deliver products that make your life easier.

With Sky® liners, our goal was to create a state-of-the-art deactivation that provides superior performance. But why did we make them blue? Restek has always been associated with the color blue; to us, it signifies strength, innovation, and excellence. We made Sky® liners blue because it represents the technological advancements and unmatched quality that define Restek products. Choose blue—the best choice for dependable results.

Simple Solutions:

Inert Sky® Inlet Liners Improve Accuracy and Precision for a Wide Range of Analytes

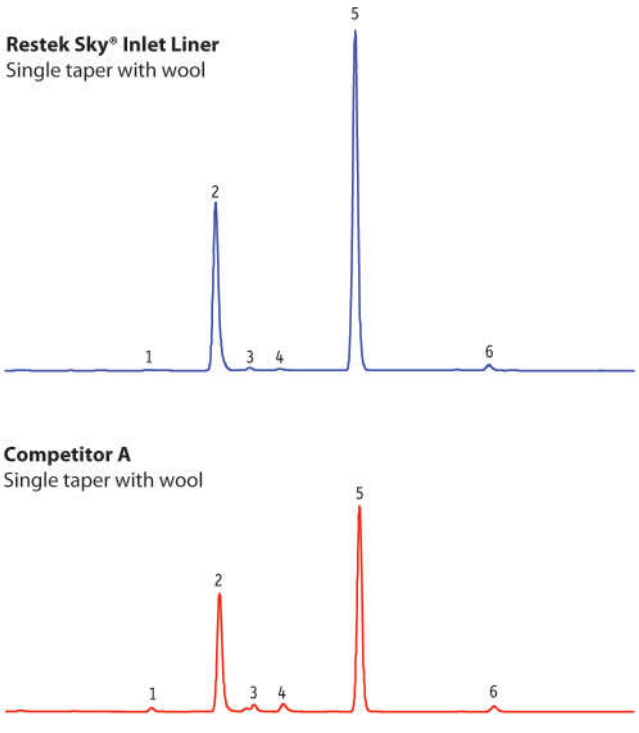
Many chromatographic problems, such as poor response and missing or tailing peaks, are caused by activity in the inlet liner. These effects complicate quantification and can be particularly problematic for sensitive analytes. Sky® inlet liners from Restek offer exceptional inertness, ensuring enhanced transfer of analytes to the column, good response, and highly symmetric peaks. The inertness of these liners is due to a state-of-the-art deactivation process that completely passivates the liner and wool so that they are inert to a wide variety of active analytes.

Some deactivations, such as base deactivation, are effective only for particular target compound chemistries. In contrast, the balanced deactivation of Sky® liners prevents interactions with many chemical classes. As shown on the following pages, complex pesticide probes, as well as both acidic and basic compounds have strong responses and excellent peak shapes, demonstrating the inertness of Sky® liners. With Sky® inlet liners, you will see improved sensitivity, accuracy, and reproducibility liner-to-liner, which allows you to quantify challenging compounds at trace levels with confidence.

Reduced Breakdown Improves Trace Analyses

Endrin and DDT are important analytes for the environmental and food safety industries, and they also serve as excellent general probes for liner inertness. Both compounds are sensitive to different modes of activity due to their chemical structures and their being analyzed at very low concentrations. As shown in Figure 1, Sky® liners are significantly more inert than comparable competitor liners, showing 3–4 times less endrin and DDT breakdown.

Figure 1: Endrin and DDT breakdown is significantly reduced with Sky® liners, demonstrating higher inertness.



Inert Sky® liners reduce analyte breakdown, giving you more accurate results.

	% Breakdown	
	Endrin	DDT
Restek	**4.8**	**1.3**
Competitor A	12	5.2

Peaks
1. DDE*
2. Endrin
3. DDD*
4. Endrin aldehyde*
5. DDT
6. Endrin ketone*

*breakdown products

GC_EV1200_1202

Column: Rxi®-5Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13620); **Sample:** Endrin (50 ng/mL) and DDT (100 ng/mL) in hexane; **Injection:** Inj. Vol.: 1 µL splitless (hold 0.75 min); **Liner:** Comparison of Sky® Single Taper Liner with Wool (cat.# 23303.5) and Agilent Single Taper Liner with Wool (cat.# 5062-3587); **Inj. Temp.:** 250 °C.; **Detector:** µ-ECD @ 300 °C.

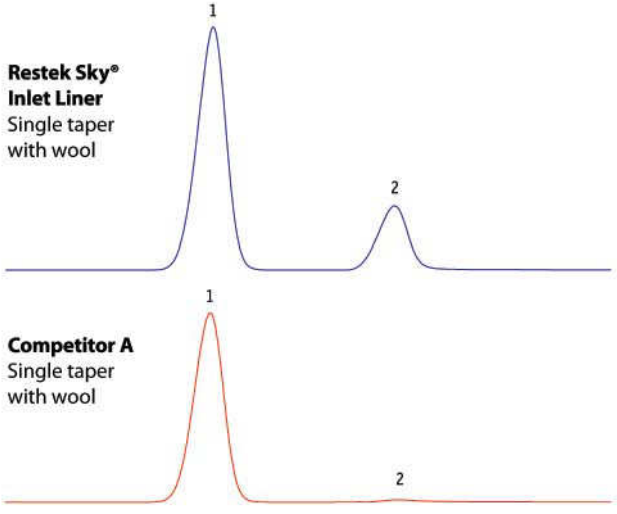
did you know?

Sky® inlet liners from Restek are extensively tested to ensure consistent product quality. The color and label have been shown not to interfere with analyses or contribute to background. Choose blue—the best liner for sensitive applications.

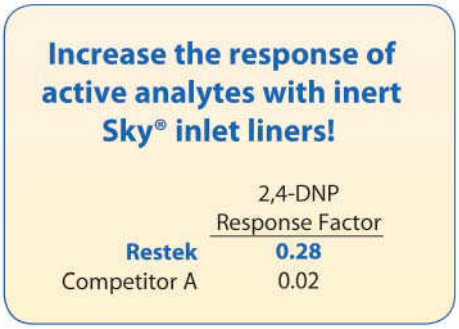
Greater Inertness Results in Higher Analyte Response

Another common probe used to illustrate inertness is 2,4-dinitrophenol (2,4-DNP), which functions as an indicator of acid compound interactions. It is used to monitor system suitability in semivolatiles methods, which benefit from the use of wool to assist in sample vaporization. As shown in Figure 2, the response of 2,4-DNP with the Sky® inlet liner, even at low concentrations, is superior to a competitor's liner. The competitor liner with wool has active sites that adsorb 2,4-DNP and reduce its response. In contrast, an excellent response is achieved using the Sky® liner, even in the presence of wool.

Figure 2: The state-of-the-art deactivation used for Sky® liners with wool results in higher responses for active acid compounds, such as 2,4-DNP.



GC_EV1204



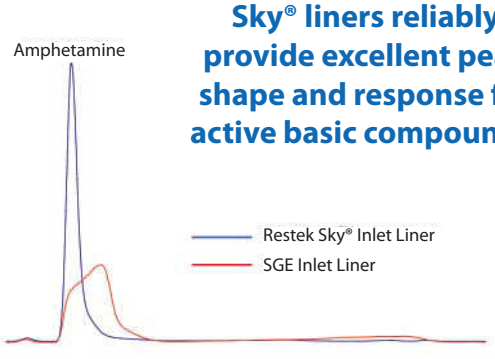
Peaks
1. Acenaphthene (IS)
2. 2,4-DNP

Column: Rxi®-5Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13620); **Sample:** 10 µg/mL each 2,4-dinitrophenol and acenaphthene standard in methylene chloride; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); **Liner:** Comparison of Sky® Single Taper Inlet Liner with Wool (cat.# 23303.5) and Agilent Single Taper Inlet Liner with Wool (cat.# 5062-3587); **Inj. Temp.:** 250 °C; **Detector:** FID @ 300 °C.

Comprehensive Deactivation Ensures Excellent Peak Shape

In addition to providing excellent results for active pesticides and acidic compounds, Sky® inlet liners are also highly inert to active basic compounds, such as underivatized amphetamines. The exceptional inertness of Sky® liners produces much better peak shape than is typically seen on other liners, resulting in simpler quantification and more accurate results (Figure 3).

Figure 3: Sky® liners are completely passivated. Even when using wool, peak shape for highly active underivatized amphetamine is excellent.



GC_CF1151

Peaks
1. Amphetamine

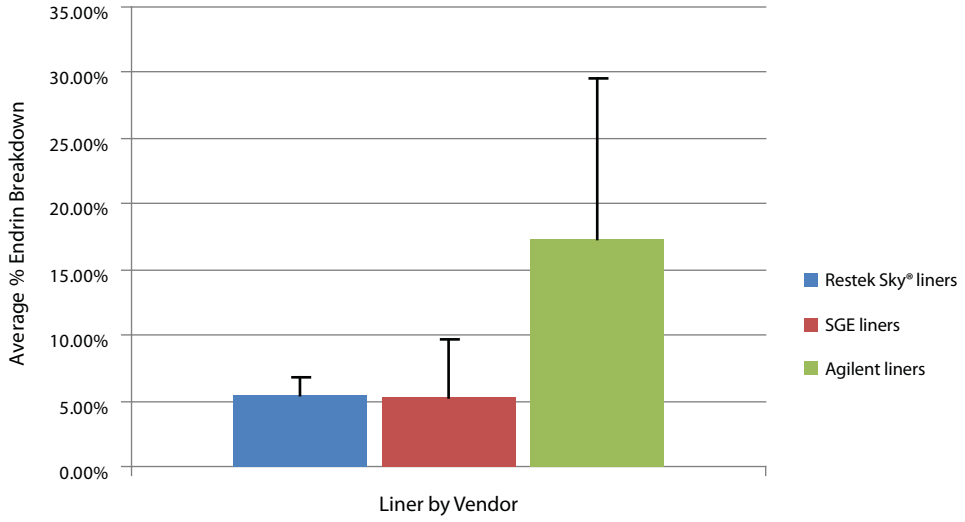
Column: Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623); **Sample:** Amphetamine; Diluent:1-chlorobutane; Conc.: ~10 µg/mL; **Injection:** Inj. Vol.: 1 µL splitless (hold 1 min); Liner: Comparison of Sky® Single Taper with Wool (cat.# 23303.5) and SGE Single Taper with Wool (cat.# 092019); Inj. Temp.: 250 °C; Purge Flow: 20 mL/min; **Oven Temp:** 45 °C to 250 °C at 20 °C/min; **Carrier Gas:** He, constant flow; Flow Rate: 2 mL/min; **Detector:** FID @ 350 °C.; Make-up Gas Flow Rate: 45 mL/min; Make-up Gas Type: N_2; **Instrument:** Agilent 7890A GC

Liner-to-Liner Reproducibility: A Measure of Consistent Quality

It's not good enough to have one quality liner. You have to be confident that every liner will give the same level of performance. We test Sky® liners extensively to ensure that each one is exceptionally inert and will provide optimal results. Using endrin breakdown as a measure of reproducibility, the data in Figure 4, based on multiple lots, illustrate that Sky® liners are more consistently inert than competitor products.

Sky® liners provide exceptional inertness across a wide range of active analytes. The consistent, comprehensive deactivation process results in the accuracy and precision you need for reliable trace-level analyses. Simplify liner selection with Sky® liners from Restek—**choose blue, the best choice for dependable results.**

Figure 4: Sky® inlet liners from Restek consistently show less endrin breakdown than comparable liners from other sources.



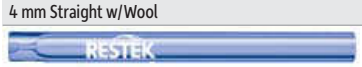
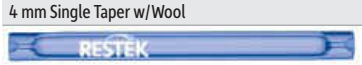
Error bars represent 3 standard deviations.

Sky® inlet liners are easily recognizable for your reordering convenience. All Sky® liners come in specially marked boxes and are packaged in ultra-clean blister packs.

Sky® Inlet Liners for Agilent GCs

COLUMN INSTALLS THIS END

Split Liners for Agilent GCs	ID OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.	
 1 mm Split	1.0 mm 6.3 mm x 78.5 mm	18740-80200 (ea.)	23333.1	23333.5	23333.25	NEW!
 4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25	
 4 mm Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm	210-4004-5 (5-pk.)	23305.1	23305.5	23305.25	
 4 mm Cyclosplitter	4.0 mm 6.3 mm x 78.5 mm		23312.1	23312.5	23312.25	

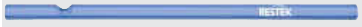
Splitless Liners for Agilent GCs	ID OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.
 2 mm Splitless	2.0 mm 6.5 mm x 78.5 mm	5181-8818 (ea.) 5183-4703 (5-pk.) 5183-4704 (25-pk.)	23313.1	23313.5	23313.25
 2 mm Splitless w/Wool	2.0 mm 6.5 mm x 78.5 mm		23314.1	23314.5	23314.25
 2 mm Single Taper	2.0 mm 6.5 mm x 78.5 mm		23315.1	23315.5	23315.25
 2 mm Single Taper w/Wool	2.0 mm 6.5 mm x 78.5 mm		23316.1	23316.5	23316.25
 4 mm Straight	4.0 mm 6.3 mm x 78.5 mm	210-3003 (ea.) 210-3003-05 (5-pk.)	23301.1	23301.5	23301.25
 4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25
 4 mm Single Taper	4.0 mm 6.5 mm x 78.5 mm	5181-3316 (ea.) 5183-4695 (5-pk.) 5183-4696 (25-pk.)	23302.1	23302.5	23302.25
 4 mm Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	5062-3587 (ea.) 5183-4693 (5-pk.) 5183-4694 (25-pk.)	23303.1	23303.5	23303.25
 4 mm Double Taper	4.0 mm 6.5 mm x 78.5 mm	5181-3315 (ea.) 5183-4705 (5-pk.) 5183-4706 (25-pk.)	23308.1	23308.5	23308.25
 4 mm Cyclo Double Taper	4.0 mm 6.5 mm x 78.5 mm		23310.1	23310.5	23310.25

Split/Splitless Liners for Agilent GCs	ID OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk
 4 mm Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	23300.1	23300.5	23300.25
 Low Pressure Drop Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm		23309.1	23309.5	

Patent pending

Sky® Inlet Liners for Agilent GCs

COLUMN INSTALLS THIS END

CIS4 and PTV Liners for Agilent GCs	ID OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	10-pk.	
 On Column PTV	1.7 mm 3.0 mm x 71 mm		23430.1	23430.5		NEW!
 Single Baffle PTV	2.0 mm 3.0 mm 71 mm	5183-2036 (10-pk.)			23431.10	NEW!
 Single Baffle PTV w/Wool	2.0 mm 3.0 mm 71 mm	5183-2038 (10-pk.)			23432.10	NEW!
 Baffled PTV	1.5 mm 3.0 mm 71 mm	5183-2037 (10-pk.)			23433.10	NEW!

Analytical Controls TPI Inlet Liners for Agilent GCs	ID OD x Length	cat.# 10-pk.	
 TPI for 0.53 mm ID columns	2.4 mm 4.0 mm x 71 mm	23429.10	NEW!
 TPI for 0.25/0.32 mm ID columns	2.4 mm 4.0 mm x 71 mm	23428.10	NEW!

SPME Liners for Agilent GCs	ID OD x Length	ea.	cat.# 5-pk.	
 SPME Liner	0.75 mm 6.35 mm x 78.5 mm	23434.1	23434.5	NEW!

Liners for Agilent MMI	ID OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	
 Single Taper w/Dimple	2.0 mm 6.4 mm x 78.5 mm	5190-2296 (ea.)	23334.1	23334.5	NEW!

Direct Injection Liners for Agilent GCs (for 0.25/0.32/0.53mm ID Columns)	ID OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.
 Drilled Uniliner (hole near bottom)	4.0 mm 6.3 mm x 78.5 mm	G1544-80730 (ea.)	23306.1	23306.5	23306.25
 Drilled Uniliner (hole near bottom) w/Wool	4.0 mm 6.3 mm x 78.5 mm		23307.1	23307.5	
 Drilled Uniliner (hole near top)	4.0 mm 6.3 mm x 78.5 mm		23311.1	23311.5	23311.25

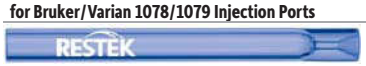
Patent pending

Sky® Inlet Liners for Bruker/Varian GCs

COLUMN INSTALLS THIS END

Liners for Bruker/Varian 1177 S/SL Injection Ports	ID OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.	
 4 mm Split Liner w/Glass Frit	4.0 mm 6.3 mm x 78.5 mm		23330.1	23330.5	
 4 mm Precision Liner w/Wool	4.0 mm 6.3 mm x 78.5 mm		23328.1	23328.5	
 4 mm Single Taper	4.0 mm 6.5 mm x 78.5 mm	392611927	23331.1	23331.5	
 4 mm Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	392611936	23332.1	23332.5	

SPI Liners for Bruker/Varian S/SL Injection Ports	ID OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.	25-pk.	
 SPI Liner	0.53 mm 4.6 mm x 54 mm	190010906	23460.1	23460.5		NEW!
 SPI Liner	0.8 mm 4.6 mm x 54 mm	190010907	23461.1	23461.5	23461.25	NEW!

Liners for Bruker/Varian 1078/1079 Injection Ports	ID OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.	25-pk.	
 3.4 mm Split–No Frit	3.4 mm 5.0 mm x 54 mm	392611945	23329.1	23329.5	23329.25	
 Split w/Glass Frit	3.4 mm 5.0 mm X 54 mm	392611946	23462.1	23462.5		NEW!
 Splitless	2.0 mm 5.0 mm X 54 mm	392611947	23463.1	23463.5		NEW!
 SPME Liner	0.75 mm 5.0 mm X 54 mm	392611948	23465.1	23465.5		NEW!
 Split Precision Liner w/Wool	3.4 mm 5.0 mm X 54 mm		23466.1	23466.5		NEW!

Patent pending

"We have been using the Sky® liners and are very pleased with how they are working out. We have been able to reduce doing maintenance on the GCs and see a big improvement on degradation."

Megan Grein
Organics Supervisor
Belmont Labs

Sky® Inlet Liners for PerkinElmer GCs

COLUMN INSTALLS THIS END

Split Liners for PerkinElmer GCs	ID OD x Length	Similar to PE part #	ea.	cat.# 5-pk.	
 Splitter w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6502009	23449.1	23449.5	NEW!
 Split Precision Liner w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6121020	23450.1	23450.5	NEW!

Splitless Liners for PerkinElmer GCs	ID OD x Length	Similar to PE part #	ea.	cat.# 5-pk.	
 Splitless w/Wool	2.0 mm 6.2 mm x 92.1 mm	N6121021	23451.1	23451.5	NEW!

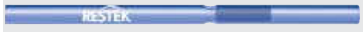
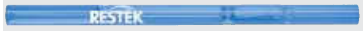
PSS Liners for PerkinElmer GCs	ID OD x Length	Similar to PE part #	ea.	cat.# 5-pk.	25-pk.
 Auto SYS XL PSS Split/Splitless w/Wool	2.0 mm 4.0 mm x 86.2 mm	N6121004	23317.1	23317.5	23317.25

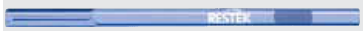
DI Liners for PerkinElmer GCs	ID OD x Length	Similar to PE part #	ea.	cat.# 5-pk.	
 Open-Top Uniliner w/Wool	4.0 mm 6.2 mm x 92.1 mm	N6502016	23452.1	23452.5	NEW!
 Drilled Uniliner (hole near top)	4.0 mm 6.2 mm x 92.1 mm	N6121022	23453.1	23453.5	NEW!
 Drilled Uniliner (hole near bottom)	4.0 mm 6.2 mm x 92.1 mm	N6502013	23454.1	23454.5	NEW!

Patent pending

Sky® Inlet Liners for Shimadzu GCs

COLUMN INSTALLS THIS END

Split Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.	
 3.5 mm Split	3.5 mm 5.0 mm x 95 mm	221-41444-01	23318.1	23318.5	23318.25	
 3.5 mm Split w/Wool	3.5 mm 5.0 mm x 95 mm		23319.1	23319.5	23319.25	
 3.5 mm Precision Liner w/Wool	3.5 mm 5.0 mm x 95 mm		23320.1	23320.5		
 Single Taper Precision Liner w/Wool	3.5 mm 5.0 mm x 95 mm		23455.1	23455.5		NEW!
 Cyclosplitter	3.5 mm 5.0 mm x 95 mm		23456.1	23456.5		NEW!

Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.	
 3.5 mm Single Taper	3.5 mm 5.0 mm x 95 mm	221-48335-01	23321.1	23321.5	23321.25	
 3.5 mm Single Taper w/Wool	3.5 mm 5.0 mm x 95 mm		23322.1	23322.5		
 Double Taper	3.5 mm 5.0 mm x 95 mm		23457.1	23457.5		NEW!

Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.	
 Split/Splitless w/Wool	3.5 mm 5.0 mm x 95 mm	221-41444-00	23458.1	23458.5	23458.25	NEW!

Liners for Shimadzu 17A PTV GCs	ID OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
 PTV w/Wool	1.6 mm 4.0 mm x 95 mm	225-09212-01	23435.1	23435.5	23435.25

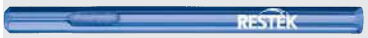
DI Liners for Shimadzu 17A, 2010, and 2014 GCs	ID OD x Length	ea.	cat.# 5-pk.	
 Uniliner w/Wool	3.5 mm 5.0 mm x 95 mm	23459.1	23459.5	NEW!

Patent pending

Sky® Inlet Liners for Thermo Scientific GCs

Sky® Inlet Liners for Thermo Scientific GCs

Split Liners for Thermo TRACE, 8000, 8000 TOP, and Focus SSL	ID OD x Length	Similar to TS part #	ea.	cat.# 5-pk.	25-pk.	
 Split Straight	3.0 mm 8.0 mm x 105 mm	453 20031	23439.1	23439.5	23439.25	NEW!
 Split Straight w/Wool	3.0 mm 8.0 mm x 105 mm		23440.1	23440.5	23440.25	NEW!
 5 mm Straight	5.0 mm 8.0 mm x 105 mm	453 20030	23323.1	23323.5	23323.25	
 5 mm Straight w/Wool	5.0 mm 8.0 mm x 105 mm		23324.1	23324.5	23324.25	
 5 mm Precision Liner w/Wool	5.0 mm 8.0 mm x 105 mm		23327.1	23327.5		

Splitless Liners for Thermo TRACE, 8000, 8000 TOP, and Focus SSL	ID OD x Length	Similar to TS part #	ea.	cat.# 5-pk.	25-pk.	
 Splitless	3.0 mm 8.0 mm x 105 mm	453 20032	23441.1	23441.5	23441.25	NEW!
 Splitless w/Wool	3.0 mm 8.0 mm x 105 mm		23442.1	23442.5	23442.25	NEW!
 Splitless Precision Liner w/Wool	5.0 mm 8.0 mm x 105 mm		23443.1	23443.5		NEW!
 5 mm Splitless	5.0 mm 8.0 mm x 105 mm	453 20033	23325.1	23325.5	23325.25	
 5 mm Splitless w/Wool	5.0 mm 8.0 mm x 105 mm		23326.1	23326.5	23326.25	

Split Liners for Thermo TRACE 1300, 1310	ID OD x Length	ea.	cat.# 5-pk.	
 Split	1.0 mm 6.3 mm x 78.5 mm	23448.1	23448.5	NEW!

Splitless Liners for Thermo TRACE 1300, 1310	ID OD x Length	ea.	cat.# 5-pk.	
 Splitless Straight	4.0 mm 6.3 mm x 78.5 mm	23445.1	23445.5	NEW!
 Splitless Single Taper	4.0 mm 6.5 mm x 78.5 mm	23446.1	23446.5	NEW!
 Splitless Single Taper w/Wool	4.0 mm 6.5 mm x 78.5 mm	23447.1	23447.5	NEW!

Split/Splitless Liners for Thermo TRACE 1300, 1310	ID OD x Length	ea.	cat.# 5-pk.	
 Split/Splitless Straight w/Wool	4.0 mm 6.3 mm x 78.5 mm	23444.1	23444.5	NEW!

Split Liners for Thermo Scientific TRACE PTV	ID OD x Length	Similar to TS part #	ea.	cat.# 5-pk.	
Split PTV	1.0 mm 2.75 mm x 120 mm	453 22054	23436.1	23436.5	NEW!
Split PTV	2.0 mm 2.75 mm x 120 mm	453 22045	23437.1	23437.5	NEW!
Baffled PTV	2.0 mm 2.75 mm x 120 mm		23438.1	23438.5	NEW!

Patent pending

COLUMN INSTALLS THIS END

Other Deactivations

Intermediate Polarity (IP) Deactivation

- Phenylmethyl-deactivated surface for better recovery of polar and nonpolar compounds.
- Compatible with most common solvents.
- Our standard deactivation—every clear Restek liner is IP deactivated unless otherwise requested.

Siltek®-Deactivation

- Maximizes the inertness of the sample pathway with proprietary deactivation.
- Minimizes breakdown.
- Low bleed.
- Thermally stable.
- "Clean and green"—manufactured without the use of harmful organic solvents.
- Ideal for chlorinated pesticides.

The patented Siltek® deactivation process for liners produces a highly inert glass surface that features high temperature stability, extreme durability, and low bleed. Try Siltek® liners, guard columns, and connectors for better recovery of sample analytes.

Siltek®-Deactivated Inlet Liners

For Siltek®-deactivated inlet liners, add the corresponding suffix number to the liner catalog number. (Cannot be used with Sky® liners.)

qty.	Siltek Liner		Siltek Liner w/Wool		Siltek Liner w/CarboFrit	
ea.	-214.1	addl. cost	-213.1	addl. cost	-216.1	addl. cost
5-pk.	-214.5	addl. cost	-213.5	addl. cost	-216.5	addl. cost
25-pk.	-214.25	addl. cost	-213.25	addl. cost	-216.25	addl. cost

Base-Deactivation

For base-deactivated inlet liners, add the corresponding suffix number to the liner catalog number. (Cannot be used with Sky® liners.)

qty.	Base-Deactivated Liner		Base-Deactivated Liner w/ Base-Deactivated Wool		Base-Deactivated Liner w/CarboFrit	
ea.	-210.1	addl. cost	-211.1	addl. cost	-229.1	addl. cost
5-pk.	-210.5	addl. cost	-211.5	addl. cost	-229.5	addl. cost
25-pk.	-210.25	addl. cost	-211.25	addl. cost	-229.25	addl. cost

Don't Forget Routine Maintenance

Inlet liners are the key to good injection port maintenance; changing them regularly helps prevent problems such as:

- Sample degradation resulting in poor response.
- Sample adsorption resulting in poor peak shape (tailing).
- Sample discrimination.
- Irreproducibility.
- Extraneous peaks from contamination or cored septum particles.

Finally, be sure to condition your liners at 20 °C higher than the operating inlet temperature for a minimum of 10 minutes to prepare them for use. By following these basic tips, you can avoid inlet problems and improve chromatographic performance.

Inlet Liners for Agilent GCs

Liners for Agilent GCs

COLUMN INSTALLS THIS END

Splitless Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.
 2 mm Splitless	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	5181-8818 (ea.) 5183-4703 (5-pk.) 5183-4704 (25-pk.)	20712	20713	20714
 4 mm Splitless	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	210-3003 (ea.) 210-3003-5 (5-pk.)	20772	20773	20774
 4 mm Splitless w/Deact. Wool	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	22400	22401	22402
 5 mm Splitless	accommodates more polar solvents and lower MW solvents	5.0 mm 6.5 mm x 78.5 mm		22975	22976	
 2 mm Splitless (Quartz)	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	18740-80220 (ea.) 5183-4707 (5-pk.)	20914	20915	
 4 mm Splitless (Quartz)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20912	20913	
 4 mm Splitless w/Deact. Wool (Quartz)	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		22403	22404	
 Single Taper Splitless (2 mm)	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20795	20796	20797
 Single Taper Splitless (4 mm)†	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5181-3316 (ea.) 5183-4695 (5-pk.) 5183-4696 (25-pk.)	20798	20799	20800
 Single Taper Splitless (4 mm) w/Deact. Wool†	trace samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5062-3587 (ea.) 5183-4693 (5-pk.) 5183-4694 (25-pk.)	22405	22406	22407
 Single Taper Splitless (5 mm)	accommodates more polar solvents and lower MW solvents	5.0 mm 6.5 mm x 78.5 mm		22973	22974	
 Double Taper Splitless (4 mm)	trace, active samples >2 µL	4.0 mm 6.5 mm x 78.5 mm	5181-3315 (ea.) 5183-4705 (5-pk.) 5183-4706 (25-pk.)	20784	20785	20786
 Cyclo Double Taper (2 mm)	trace, active, dirty samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20907	20908	
 Cyclo Double Taper (4 mm)	trace, active, dirty samples > 2 µL	4.0 mm 6.5 mm x 78.5 mm		20895	20896	20997
 Recessed Single Taper (2 mm)**	base easily packs with wool for dirty samples <2 µL	2.0 mm 6.5 mm x 78.5 mm		20980	20981	20982
 Recessed Single Taper (4 mm)**	base easily packs with wool for dirty samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20983	20984	20985
 Recessed Single Taper (4 mm) w/Deact. Wool**	base easily packs with wool for dirty samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		22408	22409	22410
 Recessed Double Taper (4 mm)**	trace, active samples >2 µL	4.0 mm 6.5 mm x 78.5 mm		20986	20987	20988

*Nominal ID at syringe needle expulsion point.
**Use with two-hole ferrule for dual-column analysis.
†Use this liner for increased sensitivity.

Inlet Liners for Agilent GCs

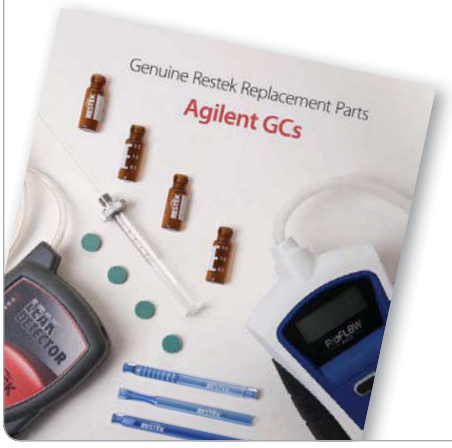
COLUMN INSTALLS THIS END

Split Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent part#	ea.	cat.# 5-pk.	25-pk.
1 mm Split**	for purge & trap inlet splitting or sample <1 µL	1.0 mm 6.3 mm x 78.5 mm	18740-80200 (ea.) 5183-4709 (5-pk.)	20972	20973	
4 mm Split w/Deact. Wool	universal, use with Agilent 7673 autosampler	4.0 mm 6.3 mm x 78.5 mm	19251-60540 (ea.) 5183-4691 (5-pk.) 5183-4692 (25-pk.)	20781	20782	20783
Laminar Cup Splitter	high MW compounds	4.0 mm 6.3 mm x 78.5 mm		20801	20802	
mini-Lam Split	high MW compounds	4.0 mm 6.3 mm x 78.5 mm		20990	20991	
Cup Splitter	high & low MW compounds	4.0 mm 6.3 mm x 78.5 mm	18740-80190 (ea.) 5183-4699 (5-pk.)	20709	20710	
Cyclosplitter	dirty samples, many injections before cleaning required	4.0 mm 6.3 mm x 78.5 mm		20706	20707	20708
2 mm Split Precision Liner w/Deact. Wool	dirty samples, trace samples	2.0 mm 6.3 mm x 78.5 mm		20823	20824	
4 mm Split Precision Liner w/Deact. Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm	210-4004-5 (5-pk.)	21022	21023	20979
4 mm Single Taper Precision Liner w/Deact. Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm	210-4022-5 (5-pk.)	22983	22984	22985

Split/Splitless Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.
Low Pressure Drop Precision Liner w/Deact. Wool	universal	4.0 mm 6.3 mm x 78.5 mm		21032	21033	
Low Pressure Drop Liner w/Deact. Wool	universal	4.0 mm 6.3 mm x 78.5 mm	5183-4647, 5183-4711 (ea.) 5183-4701, 5183-4712 (5-pk.) 5183-4713 (25-pk.)	20994	20995	20996

SPME Liners for Agilent GCs	Benefits/Uses	ID* OD x Length	cat.# ea.	cat.# 5-pk.
SPME Liner	ideal for low-volume SPME applications	0.75 mm 6.35 mm x 78.5 mm	21110	21111

*Nominal ID at syringe needle expulsion point.
**Use this liner for increased sensitivity.



Genuine Restek Replacement Parts for Agilent GCs

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www.restek.com/**GRRP**

Inlet Liners for Agilent GCs

COLUMN INSTALLS THIS END

DI Liners for Agilent GCs** (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to Agilent part #	ea.	cat.# 5-pk.	25-pk.
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		21054	21055	20998
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	G1544-80730	20756	20771	
 Double Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		20508	20509	
 Double Taper Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	G1544-80700	20954	20989	
 Drilled Cyclo-Uniliner (hole near top)	trace, dirty, high MW, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22979	22980	
 1 mm Uniliner	trace, active samples, samples <1 µL	1.0 mm 6.3 mm x 78.5 mm		21052	21053	
 Uniliner	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22268	22269	
 Cyclo-Uniliner	trace, dirty, high MW active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22270	22271	
 Open-top Uniliner w/Deact. Wool	trace, dirty, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm		22272	22273	

*Nominal ID at syringe needle expulsion point.
**Hole in Drilled Uniliner liner makes direct injection possible with EPC-equipped Agilent 6890 & 7890 GCs!

Siltek® Metal Inlet Liners
Unsurpassed Inertness & Durability!

Siltek® Metal Inlet Liners for Agilent GCs

- Won't crack, chip, or break like glass liners.
- Excellent response for pesticides, phenols, and other active compounds.

Liner Type (5.2 mm ID x 6.3 mm OD x 78.5 mm)	5-pk.	25-pk.
Cyclo Single Taper	20974	20975
Single Taper	21702	21703
Cyclosplitter	20726	20729
Split/Splitless w/Deact. Wool	21700	21701

Liners for APEX ProSep 800 & ProSep 800 Plus GCs

APEX Liners for ProSep 800 & ProSep 800 Plus GCs	Benefits/Uses:	ID* OD x Length	Similar to APEX part #	cat.# ea.
Mega IV (4.0 mm ID)	injections ≤125 µL	4.0 mm 6.0 mm x 243 mm	L-00410	21075
Micro I (1.0 mm ID)	injections ≤5 µL	1.0 mm 6.0 mm x 243 mm	L-00110	21073
MIDI II (2.0 mm ID)	injections ≤25 µL	2.0 mm 6.0 mm x 243 mm	L-00210	21074

*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END

Liners for ATAS Injectors

Liners for ATAS Injectors	Benefits/Uses:	ID* OD x Length	Similar to ATAS part #	ea.	cat.# 5-pk.
ATAS Fritted Single Taper	dirty samples	3.0 mm 5.0 mm x 80 mm	A100126	22419	22420

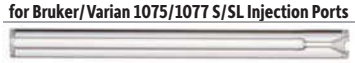
Liners for ATAS LINEX DMI System OPTIC 2 and 3 inlets	ID* OD x Length	cat.# 5-pk.
ATAS LINEX DMI Liner	3.3 mm 5.0 mm x 81 mm	22353

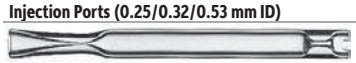
*Nominal ID at syringe needle expulsion point.

Inlet Liners for Bruker/Varian GCs

Liners for Bruker/Varian 1075/1077 S/SL Injection Ports

Split Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.	25-pk.
 1 mm Split	purge & trap inlet splitting or samples <1 µL	1.0 mm 6.3 mm x 72 mm		20970	20971	
 Splitter w/Deact. Wool	universal, use with rapid autosamplers	4.0 mm 6.3 mm x 72 mm	190010901	20792	20793	20794
 Cup Splitter	high & low MW compounds	4.0 mm 6.3 mm x 72 mm		20724	20725	
 Cyclosplitter	dirty samples, many injections before cleaning required	4.0 mm 6.3 mm x 72 mm		20727	20728	
 Frit Splitter	dirty samples, non-active compounds	4.0 mm 6.3 mm x 72 mm	190010903	20715	20716	20717
 Split Precision Liner w/Deact. Wool	dirty samples, active samples	4.0 mm 6.3 mm x 72 mm		21030	21031	

Splitless Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.	25-pk.
 2 mm Splitless	trace samples <2 µL	2.0 mm 6.3 mm x 74 mm	190010905	20721	20722	20723
 4 mm Splitless	trace samples >2 µL	4.0 mm 6.3 mm x 74 mm		20904	20905	20906

DI Liners for Bruker/Varian 1075/1077 S/SL Injection Ports (0.25/0.32/0.53 mm ID)	Benefits/Uses:	ID* OD x Length	ea.	cat.# 5-pk.
 Uniliner	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 72 mm	20345	20346

SPME Liners for Bruker/Varian 1075/1077 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	ea.	cat.# 5-pk.
 SPME Liner	ideal for low-volume SPME applications	0.75 mm 6.3 mm x 74 mm	21112	21113

Liners for Bruker/Varian S/SL Injection Ports

SPI Liners for Bruker/Varian S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.	25-pk.
 0.5 mm SPI	high linearity for 0.25 & 0.32 mm ID columns	0.53 mm 4.6 mm x 54 mm	190010906	20775	20776	20777
 0.8 mm SPI	high linearity for 0.53 mm ID columns	0.80 mm 4.6 mm x 54 mm	190010907	20778	20779	20780
 SPI with Buffer	dirty samples >1 µL, fits 0.25, 0.32 & 0.53 mm ID columns	2.4 mm 4.6 mm x 54 mm	190010908	20850	20851	20852

*Nominal ID at syringe needle expulsion point.

Liners for Bruker/Varian 1177 S/SL Injection Ports

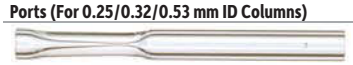
Liners for Bruker/Varian 1177 S/SL Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.
 4 mm Split w/Glass Frit	universal	4.0 mm 6.3 mm x 78.5 mm		21045	21046
 4 mm Split w/Deact. Wool	universal, use with Agilent 7673 autosampler	4.0 mm 6.3 mm x 78.5 mm	392611934		21079
 4 mm Split Precision Liner w/Deact. Wool	dirty samples, trace samples	4.0 mm 6.3 mm x 78.5 mm		20759	20762
 Low Pressure Drop Precision Liner w/Deact. Wool	trace samples <2 µL, dirty samples	2.0 mm 6.3 mm x 78.5 mm		22421	22422
 2 mm Splitless w/Deact. Wool	trace samples <2 µL	2.0 mm 6.5 mm x 78.5 mm	392599903		21077
 Single Taper Splitless (4 mm)	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611927	21896	21897
 Single Taper Splitless (4 mm) w/Deact. Wool	trace samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611928	21896-200.1	21897-200.5
 Double Taper Splitless (4 mm)	trace, active samples <2 µL	4.0 mm 6.5 mm x 78.5 mm	392611929	21891	21892

DI Liners for Bruker/Varian 1177 S/SL Injection Ports (For 0.25/0.32/0.53 mm ID Columns)	Benefits/Uses	ID* OD x Length	ea.	cat.# 5-pk.
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	21470	21471
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.3 mm x 78.5 mm	21468	21469

*Nominal ID at syringe needle expulsion point.

Liners for Bruker/Varian 1078/1079 Injection Ports

Liners for Bruker/Varian 1078/1079 Injection Ports	Benefits/Uses:	ID* OD x Length	Similar to Bruker/Varian part #	ea.	cat.# 5-pk.	25-pk.
 1078/1079 Split w/Glass Frit	dirty samples, non-active compounds	3.4 mm 5.0 mm x 54 mm	392611946	21708	21709	
 1078/1079 Splitless	trace samples <2 µL	2.0 mm 5.0 mm x 54 mm	392611947	21711	21712	
 Open 0.5 mm ID	trace samples <1 µL	0.5 mm 5.0 mm x 54 mm	392611949	20992	20993	
 1078/1079 Split–No Frit	active samples	3.4 mm 5.0 mm x 54 mm	392611945	20859	20901	20909
 Open 0.75 mm ID	trace, low volume samples	0.75 mm 5.0 mm x 54 mm	392611948	21714	21715	21716
 1078/1079 Split Precision Liner w/Deact. Wool	dirty samples, trace samples	3.4 mm 5.0 mm x 54 mm		21024	21025	

DI Liners for Bruker/Varian 1078/1079 Injection Ports (For 0.25/0.32/0.53 mm ID Columns)	Benefits/Uses	ID* OD x Length	ea.	cat.# 5-pk.
 Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 54 mm	24974	24975

*Nominal ID at syringe needle expulsion point.

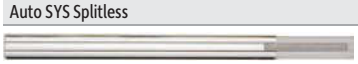
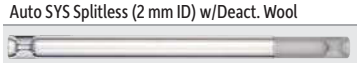
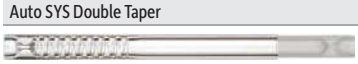
COLUMN INSTALLS THIS END

Inlet Liners for PerkinElmer GCs

Liners for PerkinElmer GCs

COLUMN INSTALLS THIS END

Split Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# 5-pk.	25-pk.
 Straight	universal, for most common analyses	3.5 mm 5.0 mm x 100 mm	N6502008	20736	20737	
 Auto SYS Splitter w/Deact. Wool	universal for most common analyses	4.0 mm 6.2 mm x 92.1 mm	N6502009	20832	20833	20834
 Auto SYS Cup Splitter	high & low MW compounds	4.0 mm 6.2 mm x 92.1 mm	N6502011	20835	20836	
 Auto SYS Cyclosplitter	dirty samples, many injections before cleaning required	4.0 mm 6.2 mm x 92.1 mm	N6502012	20910	20911	
 Auto SYS Laminar Cup Splitter	high MW compounds	4.0 mm 6.2 mm x 92.1 mm		20827	20828	
 Auto SYS Split Precision Liner w/Deact. Wool	dirty samples, trace samples	4.0 mm 6.2 mm x 92.1 mm	N6121020	21026	21027	

Splitless Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# 5-pk.	25-pk.
 Splitless (2 mm ID)	trace samples	2.0 mm 5.0 mm x 100 mm	N6502007	20730	20731	20732
 Auto SYS Splitless	headspace, purge & trap	1.0 mm 6.2 mm x 92.1 mm	N6502006	21272	21273	21274
 Auto SYS Splitless (2 mm ID) w/Deact. Wool	trace samples	2.0 mm 6.2 mm x 92.1 mm	N6121021	20829	20830	
 Auto SYS Double Taper	trace, active samples up to 4 µL	4.0 mm 6.2 mm x 92.1 mm	N6502003	20853	20854	
 Auto SYS Cyclo Double Taper	trace, dirty, active samples, up to 4 µL	4.0 mm 6.2 mm x 92.1 mm	N6502005	20899	20900	

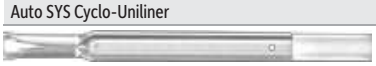
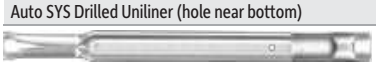
PSS Liners for PerkinElmer GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# 5-pk.
 PSS Split/Splitless (1 mm ID)	trace samples	1.0 mm 4.0 mm x 86.2 mm	N6121006	20738	20741
 Auto SYS XL PSS Split/Splitless w/Deact. Wool	most common analyses	2.0 mm 4.0 mm x 86.2 mm	N6121004	21717	21718
 PSS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	2.0 mm 4.0 mm x 86.2 mm		22986	22987

*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END

Zero Dilution Liners for PerkinElmer Auto SYS and Clarus GCs	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# 5-pk.
 Zero Dilution Inner Liner	headspace analysis	1.0 mm 2.0 mm x 73 mm	N1011446	22990	22991
 Zero Dilution Outer Liner	headspace analysis	2.5 mm 6.2 mm x 90 mm	N1011445	22992	22993

Zero Dilution Liners for PerkinElmer GCs with PSS Inlets	Benefits/Uses:	ID* OD x Length	Similar to PE part #	ea.	cat.# 5-pk.
 Zero Dilution Inner Liner	headspace analysis	1.0 mm 2.0 mm x 73 mm	N1011446	22990	22991
 Zero Dilution Outer Liner	headspace analysis	2.5 mm 4.2 mm x 83 mm	N1011447	24978	24979

DI Liners for PerkinElmer GCs (For 0.25/0.32/0.53mm ID Columns)	Benefits/Uses	ID* OD x Length	Similar to PE part #	ea.	cat.# 5-pk.
 Auto SYS Open-Top Uniliner w/Deact. Wool	trace, dirty, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502016	20837	20838
 Auto SYS Cyclo-Uniliner	trace, dirty, high MW active samples, high linearity	4.0 mm 6.2 mm x 92.1 mm	N6502017	20839	20840
 Auto SYS Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6121022	20819	20822
 Auto SYS Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502013	21293	21294
 Auto SYS Single Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	4.0 mm 6.2 mm x 92.1 mm	N6502014	21295	21296

*Nominal ID at syringe needle expulsion point.

Inlet Liners for Shimadzu GCs

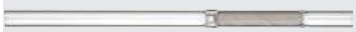
Liners for Shimadzu 14A GCs

Split Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
 Split	universal, for most common analyses	3.5 mm 5.0 mm x 99 mm	221-32544-01	20860	20861	20862
 Cyclosplitter	dirty samples, many injections before cleaning required	3.5 mm 5.0 mm x 99 mm		20870	20871	
 Laminar Cup Splitter	high MW compounds	3.5 mm 5.0 mm x 99 mm		20868	20869	

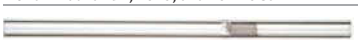
Splitless Liners for Shimadzu 14A GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
 3.5 mm Splitless	trace samples	3.5 mm 5.0 mm x 99 mm	221-32544-00	20863	20864	20865

*Nominal ID at syringe needle expulsion point.

Liners for Shimadzu17A, 2010, and 2014 GCs

Split Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
 1 mm Split	purge & trap, fast GC	1.0 mm 5.0 mm x 95 mm		20976	20977	20978
 3.5 mm Split	universal, for most common analyses	3.5 mm 5.0 mm x 95 mm	221-41444-01	22283	22284	22285
 2 mm Split Precision Liner w/Deact. Wool	dirty samples, trace samples	2.0 mm 5.0 mm x 95 mm		22171	22172	
 3.5 mm Split Precision Liner w/Deact. Wool	dirty samples, trace samples	3.5 mm 5.0 mm x 95 mm		21020	21021	
 3.5mm Single Taper Precision Liner w/Deact. Wool	dirty samples, trace samples	3.5 mm 5.0 mm x 95 mm		22173	22174	
 Cyclosplitter	dirty samples, many injections before cleaning required	3.5 mm 5.0 mm x 95 mm		22072	22073	

Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	
 2 mm Single Taper Splitless	universal, trace samples	2.0 mm 5.0 mm x 95 mm		22276	22277	
3.5 mm Single Taper Splitless	universal, trace samples	3.5 mm 5.0 mm x 95 mm	221-48335-01	22286	22287	
 Double Taper Splitless	reduces backflash and catalytic decomposition	3.5 mm 5.0 mm x 95 mm		22274	22275	

Split/Splitless Liners for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses:	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
 Split/Splitless w/Deact. Wool	universal, for most common analyses	3.5 mm 5.0 mm x 95 mm	221-41444-00	20955	20956	20957

*Nominal ID at syringe needle expulsion point.

COLUMN INSTALLS THIS END

COLUMN INSTALLS THIS END

Liners for Shimadzu 17A, 2010, and 2014 GCs

SPME Liner for Shimadzu 17A, 2010, and 2014 GCs	Benefits/Uses	ID* OD x Length	ea.	cat.# 5-pk.
 SPME Liner	ideal for low volume SPME applications	0.75 mm 5.0 mm x 95 mm	22278	22279

DI Liners for Shimadzu 17A, 2010, and 2014 GCs (0.25/0.32/0.53 mm ID)	Benefits/Uses	ID* OD x Length	ea.	cat.# 5-pk.
 Uniliner w/Deact. Wool	trace, dirty, high MW active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21713	21719
 Open-Top Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21285	21286
 Open-Top Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21287	21288
 Single Taper Drilled Uniliner (hole near top)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21289	21290
 Single Taper Drilled Uniliner (hole near bottom)	trace, active samples, high recovery & linearity	3.5 mm 5.0 mm x 95 mm	21291	21292

*Nominal ID at syringe needle expulsion point.

Liners for Shimadzu 17A PTV GCs

Liners for Shimadzu 17A PTV GCs	Benefits/Uses	ID* OD x Length	Similar to Shimadzu part #	ea.	cat.# 5-pk.	25-pk.
 17A PTV Liner w/Deact. Wool	trace, dirty, high & low MW active samples	1.6 mm 4.0 mm x 95 mm	225-09212-01	21705	21706	21707

*Nominal ID at syringe needle expulsion point.

Inlet Liners for Thermo Scientific GCs

Liners for TRACE, 8000, 8000 TOP & Focus SSL

COLUMN INSTALLS THIS END

Split Liners for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# 5-pk.	25-pk.
 1 mm Split	purge & trap, fast GC	1.0 mm 8.0 mm x 105 mm	453 20075	20916	20917	
 3 mm Split	universal	3.0 mm 8.0 mm x 105 mm	453 20031	20936	20937	20938
 5 mm Split	universal	5.0 mm 8.0 mm x 105 mm	453 20030	20939	20940	20941
 Laminar Cup Splitter	high MW compounds	4.0 mm 8.0 mm x 105 mm		20948	20949	
 Cup Splitter	high & low MW compounds	4.0 mm 8.0 mm x 105 mm		20950	20951	
 5 mm Split Precision Liner w/Deact. Wool	dirty samples, trace samples	5.0 mm 8.0 mm x 105 mm		22288	22289	

Splitless Liners for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# 5-pk.	25-pk.
 Splitless (3 mm ID)	trace samples	3.0 mm 8.0 mm x 105 mm	453 20032	20942	20943	20944
 Splitless (5 mm ID)	trace samples	5.0 mm 8.0 mm x 105 mm	453 20033	20945	20946	20947
 Double Taper	trace, active samples up to 4 µL	4.0 mm 8.0 mm x 105 mm		20952	20953	
 5 mm Splitless Precision Liner w/Deact. Wool	dirty samples, trace samples	5.0 mm 8.0 mm x 105 mm		21028	21029	

DI Liners for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL (0.32 & 0.53mm ID columns)	Benefits/Uses:	ID* OD x Length	ea.	cat.# 5-pk.
 Uniliner w/Deact. Wool	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	21005	21006
 Drilled Uniliner (hole near top)	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	22411	22412
 Drilled Uniliner (hole near bottom)	trace, active samples, high recovery, & linearity	5.0 mm 8.0 mm x 105 mm	22413	22414

*Nominal ID at syringe needle expulsion point.

Liners for TRACE PTV

COLUMN INSTALLS THIS END

Split Liners for Thermo Scientific TRACE PTV	Benefits/Uses:	ID* OD x Length	Similar to TS part #	ea.	cat.# 5-pk.
1 mm ID Glass Liner	trace samples, high recovery & linearity	1.0 mm 2.75 mm x 120 mm	453 22054	21114	21115
2 mm ID Glass Liner	universal	2.0 mm 2.75 mm x 120 mm	453 22045	21116	21117
Baffle Liner	trace samples	2.0 mm 2.75 mm x 120 mm		22074	22075

*Nominal ID at syringe needle expulsion point.

Siltek® Treated Metal Inlet Liners for Thermo Scientific GCs

- Won't crack, chip, or break like glass liners.
- Excellent response for pesticides, phenols, and other active compounds.

Liner Type (5.0 mm ID x 8.0 mm OD x 105 mm)	ea.	5-pk.
5 mm ID Split/Splitless w/Deact. Wool	—	21004
Liner Type (2.75 mm OD x 120 mm)	**ea.**	**5-pk.**
1 mm ID Split/Splitless*	21080	21081
2 mm ID Split/Splitless*	21082	21083

*Works with PTV injectors.

Inlet Liner Accessories

24324

Deactivated Wool

- More inert than our traditional wool.
- Use to vaporize a sample in a liner prior to introduction into a capillary column.

Description	qty.	cat.#
Deactivated Wool	10 grams	24324

20999

Base-Deactivated Wool

Ideal for amines and other basic compounds.

Description	qty.	cat.#
Base-Deactivated Wool	10 grams	20999

Prepacked Inlet Liners

Let Restek do the work! Just add the appropriate suffix to the liner catalog number.

qty.	Wool	CarboFrit†	
ea.	-200.1	-209.1	addl. cost
5-pk.	-200.5	-209.5	addl. cost
25-pk.	-200.25	-209.25	addl. cost

†CarboFrit® inserts require a neck greater than 2 mm.

CarboFrit® Inlet Liner Packing Material

20295

- Highly inert.
- Extends analytical column lifetime.
- Enhances reproducibility of split and splitless injections.
- Uniform pore size and consistent packing density guarantee consistent flow through the liner.
- Easy to install in any liner with an ID > 3.5 mm when using puller-inserter tool listed below.*

Add the corresponding suffix number to the liner catalog number.

qty.	suffix	
ea.	-209.1	addl. cost
5-pk.	-209.5	addl. cost
25-pk.	-209.25	addl. cost

*Liners with IDs less than 3.5 mm are difficult to pack. We will pack them on a custom basis (minimum neck ID of 2 mm required).

Replacement CarboFrit® Inserts

Description	qty.	cat. #
Frits for liner ID ≤ 4 mm	10-pk.	20295
Frits for liner ID > 4 mm	10-pk.	20294

tech tip

Use of Packings With an Autosampler

We recommend using an injection port liner with wool or CarboFrit® packing when making injections with an autosampler. If there is no packing material in the liner, the solvent droplets act like water on a hot iron: they bounce around until vaporized (Leidenfrost phenomenon). Because autosamplers make rapid injections, samples can be incompletely vaporized, leading to nonreproducible peak response and tailing. You can prevent this by using wool or CarboFrit® packing material in the splitless liner to provide a surface for the solvent droplets to "sit" on until the heat from the injector vaporizes them.

21642

CarboFrit® Puller/Inserter Tool

- Hook end for removing CarboFrit® inserts.
- Bent end (90°) for inserting CarboFrit® inserts.

Description	qty.	cat.#
CarboFrit Puller/Inserter Tool	ea.	21642

Mini Wool Puller/Inserter

Insert and remove wool plugs easily. Order a spare pack so you'll always have one available.

Description	qty.	cat.#
Mini Wool Puller/Inserter	2-pk.	20114

Eliminates user variation!

Inlet Liner Packing Tool

- Position wool reproducibly every time.
- Accurate to a specific, measured depth.
- Can be used with all manufacturers' liners.

Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.

Place a plug of loosely bound wool at the top of the inlet liner.

Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is now positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#
Inlet Liner Packing Tool	ea.	20339

Recommended for inlet liners with an ID ≥ 2 mm.

No more burned fingers!

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.

Description	qty.	cat. #
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658

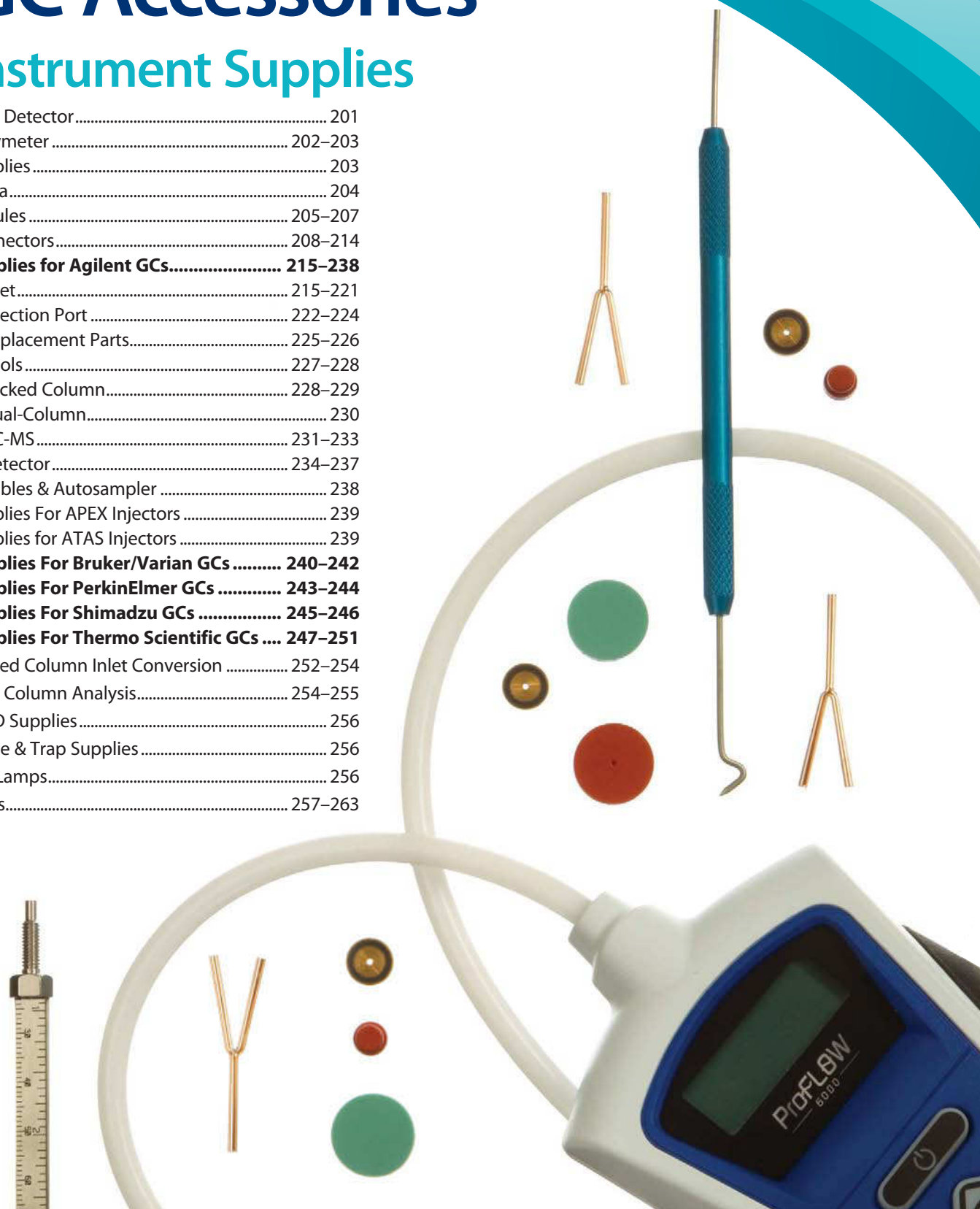
tech tip

Injector Maintenance

Approximately ninety percent of "bad" chromatography is traceable to problems in the injection port. These problems include contaminated carrier gas, incorrect injector flows, active or dirty sites on inlet seals and liners, improper use of wool, leaks, backflash, discrimination, incorrect injector temperature, poor column installation, and use of the wrong injection technique. To minimize injection port problems, set up a routine maintenance schedule and be sure to investigate the injector first when troubleshooting.

GC Accessories

Instrument Supplies



Restek Electronic Leak Detector

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek Leak Detector.

Features & benefits include:

- Ergonomic, handheld design.
- Rugged side grips for added durability.
- Handy probe storage for cleanliness and convenience.
- Long-lasting battery; up to 6 hours of continuous use.
- Automatic shutoff.
- A convenient carrying and storage case.
- Easy-to-clean probe assembly.
- A universal charger set (U.S., European, UK, and Australian plugs included).

Backed by a 1-year warranty, the Restek Leak Detector is the industry standard for performance and affordability in handheld leak detectors.

22839

Leak Detector Facts

Detectable Gases:	Helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable Ni-MH internal battery pack (6 hours normal operation)
Operating Temperature Range:	32–120 °F (0–48 °C)
Humidity Range:	0–97%
Warranty:	One year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

Limits of Detection

These gases can be detected with the Restek Electronic Leak Detector at the following leak rates:

Minimum Detectable Gas Limits and Indicating LED Color:

- Helium, 1.0 x 10^{-5}, red LED
- Hydrogen*, 1.0 x 10^{-5}, red LED
- Nitrogen, 1.4 x 10^{-3}, yellow LED
- Argon, 1.0 x 10^{-4}, yellow LED
- Carbon Dioxide, 1.0 x 10^{-4}, yellow LED

Gas detection limits measured in atm cc/sec.

Carrying/storage case included with purchase of unit.

Description	qty.	cat.#
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22839
Leak Detector Routine Maintenance Review**	ea.	22839-R
Soft-Side Storage Case	ea.	22657
Small Probe Adaptor	ea.	22658

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system and/or into the leak detector.

*Caution: The Restek Electronic Leak Detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. When using it to detect hydrogen, the Restek Electronic Leak Detector may only be used for determining trace amounts in a GC environment.

22657

Optional soft-side storage case is ideal for storing your leak detector or flowmeter in smaller spaces, such as your toolbox.

22658

Verify hard-to-reach leaks using the small probe adaptor (sold separately).

Checking for leaks maintains the integrity of a GC system.

restek recommends

When your Leak Detector batteries need to be replaced, send the unit to us for a routine maintenance review to ensure continued sensitivity and reliability. We will replace not only the batteries, but also the probe and internal/external tubing. We will also recertify your unit. Contact Customer Service to send in your Leak Detector for maintenance (cat. #22839-R).

22656

restek recommends

Recalibrate your ProFLOW 6000 flowmeter once every year. Prolonged failure to recalibrate your unit may result in increased error. To always get the most accurate flow measurements, contact Customer Service to send in your flowmeter for recalibration (cat.# 22656-R).

22657

Optional soft-side storage case is ideal for storing your leak detector or flowmeter in smaller spaces, such as your toolbox.

Restek ProFLOW 6000 Electronic Flowmeter

State-of-the-art features include:

- Measures volumetric flow for gases across a range of 0.5–500 mL/min.
- NIST traceable calibration.
- Ex rating (electrical apparatus for explosive gas atmospheres) for hydrogen and related gas types.
- Accuracy of ± 2% of flow reading or ± 0.2 mL/min, whichever is greater.
- Over-range warning indicator.
- Auto shutoff feature.
- Use as a benchtop or handheld unit.
- Ergonomic design and side grips for comfort.
- Measures most gas types.*
- Convenient carrying/storage case included.
- Uses 2-AA batteries (included).
- Data output via USB port.
- 1-year warranty.
- Recalibration service available.

Flowmeters that can measure flammable gases are becoming mandatory due to the increased use of hydrogen in chromatography. With its Ex rating, the Restek ProFLOW 6000 flowmeter is designed specifically with explosive and flammable gases in mind.

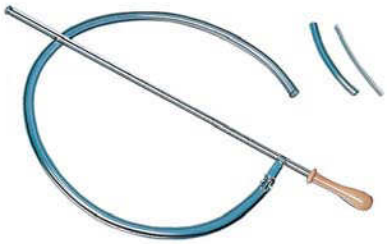
The Restek ProFLOW 6000 is the only flowmeter you need for any type of chromatography gas measurement because of its wide range of capabilities. The ProFLOW 6000 is an electronic device capable of measuring volumetric flow for most gases. Real-time measurements can be made for various types of flow paths, including continually changing gas types. This portable unit is designed for easy handheld use, and the stand adds benchtop convenience.

Flowmeter Facts:

Type of Flowmeter:	Volumetric
Battery:	2-AA
Operating Temp. Range:	32–120 °F (0–48 °C)
Warranty:	One year
Certifications:	CE, Ex
Compliance:	WEEE, RoHS

Description	qty.	cat.#
Restek ProFLOW 6000 Electronic Flowmeter With Hard-Sided Carrying Case	ea.	22656
ProFLOW 6000 Recalibration Service	ea.	22656-R
Soft-Side Storage Case	ea.	22657

*The flowmeter is designed to measure clean, dry, non-corrosive gases.



20135

Soap Film Bubble Flowmeter

- 1 mL flowmeter for flows between 0.1 and 10 cc/min.
- 50 mL flowmeter for flows between 10 and 300 cc/min.
- Includes a reservoir bulb, twenty-four inches (60 cm) of 1/4-inch ID tubing, adaptor tubes for 1/8-inch tubing and 0.53 mm ID capillary columns, and Velcro® fasteners.

Description	Volume	qty.	cat.#
Bubble Flowmeter	1 mL	ea.	20135
Bubble Flowmeter	50 mL	ea.	20136

20612

Capillary Column Rinsing Reservoir Kit

Restore the performance of bonded-phase capillary columns by dissolving and removing soluble, nonvolatile residue, using this reservoir kit. The 50 mL rinsing reservoir is equipped with 1/4-inch inlet and outlet connections and includes a built-in fritted disk to prevent particulate matter from contaminating the column. The kit includes: reservoir, pressure regulator, fittings, ferrules, and tubing. Reservoir also available separately.

Description	qty.	cat.#
Rinsing Reservoir Complete Kit	kit	20612
Rinsing Reservoir only	ea.	20613

Column not included.

Methane Cylinder Kit

(For optimizing linear velocity)

Setting the column flow rate by injecting methane and optimizing linear velocity is a preferred method for establishing reproducible retention times (ASTM Method E1510-93). The kit includes a Scotty® 14 cylinder containing 1% methane in helium, a MINICYL regulator, a syringe adaptor, and a package of twenty-five septa for the adaptor.

20197

Description	qty.	cat.#
Methane Cylinder Kit	kit	20197
Replacement Septa for Syringe Adaptor	25-pk.	20198
Replacement Methane Cylinder	ea.	20199

21000

FID Flow Measuring Adaptor

for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
FID Flow Measuring Adaptor	19301-60660	ea.	21000

HANDY septum size chart

Instrument	Septum Diameter (mm)
Agilent (HP)	
5880A, 5890, 6850, 6890, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5
Bruker/Varian	
Injector type:	
Packed column	9.5/10
1078/1079	10/11
1177	9
1075/1077	11
Finnigan (TMQ)	
GC 9001	9.5
GCQ	9.5
QCQ	9.5
TRACE 2000	9.5
PerkinElmer	
Sigma series	11
900,990	11
8000 series	11
Auto SYS	11
Auto SYS XL	11
Shimadzu	
All models	Plug
SRI	
All models	Plug
Thermo Scientific	
TRACE GC	17
GCQ w/TRACE, PTV	17
8000 series	17
1300 and 1310 GC	11
Tracor	
540	11.5
550,560	9.5

tech tip

Tips for Handling Septa

All septa, regardless of composition, puncturability, or resistance to thermal degradation will fail if they are mishandled. Overtightening a septum nut invariably will reduce septum lifetime by increasing coring/splitting. All septa contain volatile materials (e.g., phthalates) that are released when the septum is heated (septum bleed). Because most GCs are equipped with a septum purge, septum bleed generally will disappear within 30 minutes after installing a new septum and exposing it to normal injector temperatures. All Restek septa are preconditioned and are ready to use without delay.

Restek Thermolite® Septa

- Usable to 340 °C inlet temperature*.
- Precision molding assures consistent, accurate fit.
- Excellent puncturability.
- Preconditioned and ready to use.
- Do not adhere to hot metal surfaces.
- Packaged in ultra-clean blister packs**.
- A Restek exclusive!

Septum Diameter	50-pk.	100-pk.
5 mm (3/16")	27121	27122
6 mm (1/4")	27124	27125
7 mm	27127	27128
8 mm	27130	27131
9 mm	27133	27134
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143
11.5 mm	27145	27146
12.7 mm (1/2")	27148	27149
17 mm	27151	27152
Shimadzu Plug	27154	27155

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo Scientific instruments.
*For 17 mm injectors, the maximum temperature is 330 °C.
**12.7 mm and 17 mm septa packaged in precleaned glass jars.

Premium Non-Stick BTO® Septa

NEW!

- Usable to 400 °C inlet temperature*.
- New plasma coating eliminates sticking in the injection port.
- Precision molding ensures consistent, accurate fit.
- Partial predrilled CenterGuide design.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs**.
- Each batch GC-FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC-MS applications.

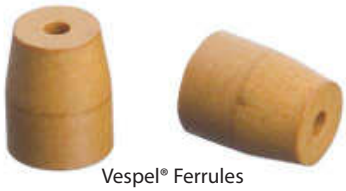
Septum Diameter	50-pk.	100-pk.
5 mm CenterGuide	27082	27083
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091
11.5 mm CenterGuide	27092	27093
12.7 mm (1/2") CenterGuide	27094	27095
17 mm CenterGuide	27096	27097
Shimadzu Plug	27098	27099

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo Scientific instruments.
*For 17 mm injectors, the maximum temperature is 330 °C. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.
**12.7 mm and 17 mm septa packaged in precleaned glass jars.

Measure your old septum here (size in mm)

Vespel® Ferrules

- 100% high-temperature polyimide.
- Stable to 350 °C.
- Durable, leak-tight.


Vespel® Ferrules

Graphite Ferrules

- Preconditioned to eliminate out-gassing.
- High-purity, high-density graphite.
- Smoother surface and cleaner edges than conventional graphite ferrules.
- Contain no binders that can off-gas or adsorb analytes.
- Stable to 450 °C.

Vespel®/Graphite Ferrules

- 60%/40% Vespel®/graphite blend offers the best combination of sealing and ease of workability.
- Seal with minimal torque, reusable, and preferred for vacuum and high-pressure uses.
- Stable to 400 °C.
- Recommended for mass spec transfer lines.

tech tip

Choosing the Right Ferrule

Graphite ferrules are soft, easy to seal, stable to 450 °C, and contain no binders that might off-gas. Vespel®/graphite ferrules work better for vacuum and high-pressure applications (e.g., GC-MS) because they will not fragment or allow oxygen to permeate into the system, whereas graphite ferrules will. Because Vespel®/graphite ferrules are made from a harder material, they might require retightening after several temperature cycles.

Capillary Ferrules for 1/16-Inch Compression-Type Fittings

Available in Vespel®, graphite, or Vespel®/graphite material.

Ferrule ID	Fits Column ID	qty.	Vespel		Graphite		Vespel/Graphite	
0.3 mm		10-pk.	22213		20233		20275	
0.4 mm	0.10/0.15/0.18/0.25/0.28 mm	10-pk.	22214		20200		20211	
0.4 mm	0.10/0.15/0.18/0.25/0.28 mm	50-pk.	—	—	20227		20229	
0.5 mm	0.32 mm	10-pk.	22215		20201		20212	
0.5 mm	0.32 mm	50-pk.	—	—	20228		20231	
0.6 mm	0.28 mm**	10-pk.	—	—	—	—	20232	
0.8 mm	0.45/0.53 mm	10-pk.	22216		20202		20213	
0.8 mm	0.45/0.53 mm	50-pk.	—	—	20224		20230	
1.0 mm	0.75 mm*	10-pk.	22217		21058		24912	
1.2 mm	0.75 mm*	10-pk.	22218		—	—	—	—
1.6 mm	1.00 mm*	10-pk.	—	—	21060		—	—

*For micropacked columns.
**For 0.28 mm MXT columns.


Graphite Ferrules


Vespel/®Graphite Ferrules

Encapsulated Ferrules for 1/16-Inch Compression Fittings

- Reusable—will not deform and stick in fittings.
- Less torque needed to seal ferrule.
- Restek's unique blend of graphite minimizes fragmentation and out-gassing.

Ferrule ID	Fits Column ID	qty.	cat.#
0.4 mm	0.25 mm	10-pk.	21036
0.5 mm	0.32 mm	10-pk.	21037
0.8 mm	0.53 mm	10-pk.	21038


Encapsulated Graphite Ferrules

Ferrules

Compact Ferrules for Agilent 5890/6890/6850/7890 GCs

Available in graphite or Vespel®/graphite material.

Ferrule ID	Fits Column ID	qty.	Graphite	Vespel/Graphite
0.4 mm	0.25/0.28 mm	10-pk.	20250	20238
0.4 mm	0.25/0.28 mm	50-pk.	20251	20239
0.5 mm	0.32 mm	10-pk.	21007	20248
0.5 mm	0.32 mm	50-pk.	21008	20249
0.8 mm	0.45/0.53 mm	10-pk.	20252	20263
0.8 mm	0.45/0.53 mm	50-pk.	20253	20264
1.0 mm	0.75 mm*	10-pk.	21059	— —
1.6 mm	1.00 mm*	10-pk.	21061	— —

*For micropacked columns.

Standard Ferrules for 1/16-, 1/8-, and 1/4-Inch Fittings

Available in Vespel®, graphite, or Vespel®/graphite material.

Fitting Size	Ferrule ID	qty.	Vespel		Graphite		Vespel/Graphite
1/4"	3/16"	5-pk.	—	—	—	—	20258
1/16"	1/16"	10-pk.	22210		20207		20218
1/8"	1/8"	10-pk.	22211		20208		20219
1/8"	reduce to 1/16"	10-pk.	—	—	20209		20220
1/4"	1/4"	10-pk.	22212		20210		20221
1/4"	reduce to 1/8"	10-pk.	22219		20225		20222
1/4"	reduce to 1/16"	10-pk.	—	—	20226		20223

Two-Hole Ferrules for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespel/Graphite
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

Reducing Ferrules

Available in graphite or Vespel®/graphite material.

Fitting Size	Ferrule ID	Fits Column ID	qty.	Graphite	Vespel/Graphite
1/8"	0.4 mm	0.25 mm	5-pk.	20205	20254
1/8"	0.5 mm	0.32 mm	5-pk.	20205	20255
1/8"	0.8 mm	0.53 mm	5-pk.	20206	20215
1/4"	0.4 mm	0.25 mm	5-pk.	20203	— —
1/4"	0.5 mm	0.32 mm	5-pk.	20203	20257
1/4"	0.8 mm	0.45/0.53 mm	5-pk.	20204	20217

Blank Ferrules for 1/16-Inch Fittings

Fitting Size	Ferrule ID	qty.	Vespel/Graphite
1/16"	no hole	10-pk.	20240

PTFE Ferrules

- Upper temperature limit 250 °C.
- 100% PTFE; completely inert.
- One-piece design requires no back ferrule.

Fitting Size	Ferrule ID	qty.	cat.#
1/16"	1/16"	10-pk.	21122
1/16"	0.4 mm	10-pk.	21123
1/16"	0.5 mm	10-pk.	21124
1/16"	0.8 mm	10-pk.	21125
1/8"	1/8"	10-pk.	21126
3/16"	3/16"	10-pk.	21127
1/4"	1/4"	10-pk.	21128

Graphite Ferrules

(M4 Fittings) for Thermo Scientific TRACE, 8000, 8000 TOP & Focus GCs

- Preconditioned to eliminate out-gassing.
- High-purity, high-density graphite.
- Smoother surface and cleaner edges than conventional graphite ferrules.
- Contain no binders that can off-gas or adsorb analytes.
- Stable to 450 °C.

Ferrule ID	Fits Column ID	Similar to TS part #	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	—	22221	22222
0.4 mm	0.18–0.28 mm	29013488 (2-pk.) 29053488 (10-pk.)	20280	20281
0.5 mm	0.32 mm	29013487 (2-pk.) 29053487 (10-pk.)	20282	20283
0.8 mm	0.45–0.53 mm	29013486 (2-pk.) 29053486 (10-pk.)	20284	20285

5 mm Ferrules for Shimadzu 17A GCs

- For use with packed columns.
- Graphite construction.

Description	qty.	cat.#
5 mm Ferrules for Shimadzu 17A GCs	10-pk.	21121

Graphite Ferrules for Shimadzu 17A, 2010, and 2014 GCs

- Graphite two-piece construction.
- Available in 0.4, 0.5, and 0.8 mm sizes.
- Packaged on mandrel for easy handling.

Ferrule ID	Fits Column ID	Similar to Shimadzu part #	qty.	cat.#
0.4 mm	0.25 mm and less	220-90765-00	10-pk.	24827
0.5 mm	0.32 mm	221-32126-05	10-pk.	24828
0.8 mm	0.53 mm	221-32126-08	10-pk.	24829

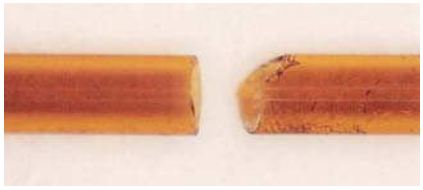
GRAPHPACK® 2 m Ferrules for Gerstel CIS 3 and CIS 4 PTV Inlets

Fits Column ID	Similar to Gerstel part #	qty.	cat.#
0.25 mm	001805-040-00	10-pk.	22223
0.32 mm	001805-045-00	10-pk.	22224
0.53 mm	001805-007-00	10-pk.	22225

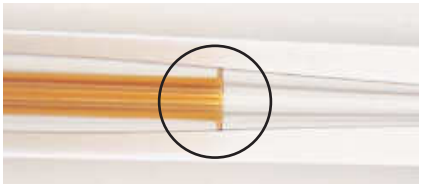
Restek Press-Tight® Connectors

Press-Tight® connectors are lightweight, quickly installed, and easy to use. They connect fused silica tubing having outside diameters ranging from 0.33 to 0.74 mm (Restek 0.1 to 0.53 mm ID). Press-Tight® connectors do not cause solvent tailing, or adsorb active compounds.

Press-Tight® connectors most often are used to connect a guard column to an analytical column. They also are used to connect columns differing in polarity, for unique separations, or to repair a broken column.



Make a clean, square cut for optimum connector performance. The cut on the right will produce a poor seal.



A brown ring indicates a proper seal.

Obtaining a leak-tight seal:

To achieve optimum performance from these connectors, begin with a properly cut fused silica column or retention gap end. Even if you use polyimide resin (cat.# 20445, page 209) for extra insurance, a poorly cut capillary column will make an inadequate seal.

Press the cut ends into the connector, then establish a flow, and leak-check the seal with a Restek Electronic Leak Detector (cat.# 22839, page 201) before heating the system.

What is the maximum temperature for a Press-Tight® connector?

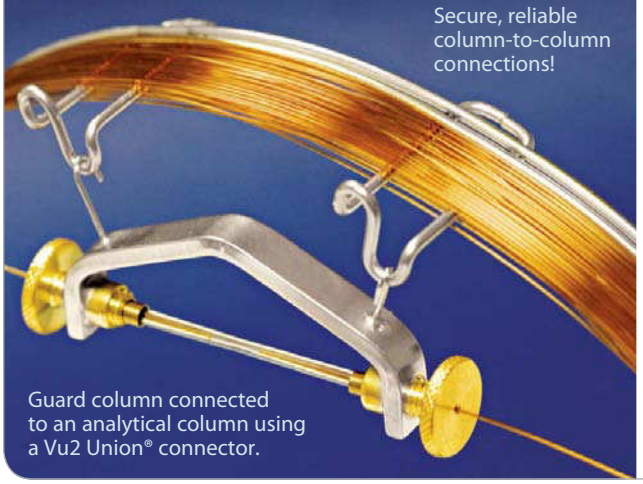
Press-Tight® connectors are effective at oven temperatures up to 325 °C, the temperature at which the polyimide coating on the column decomposes and the connection will begin to leak. We strongly recommend using a Vu2 Union® (page 210) or SeCure® "Y" (page 211) connector if oven temperatures will exceed 325 °C for prolonged periods of time.

Can Press-Tight® connectors be used with MXT® columns?

No. To achieve a leak-tight fused silica to stainless steel connection, we recommend an MXT® connector (see page 213).

Let Restek Make the Connection!

Secure, reliable column-to-column connections!



Guard column connected to an analytical column using a Vu2 Union® connector.

Restek will connect a guard column/transfer line to any analytical column, using a Vu2 Union® connector. We will leak-check the connection and confirm analytical integrity by analyzing a test mixture. To order a preconnected guard column/transfer line, add the three-digit suffix from the chart below to any analytical column catalog number. Example: A 5 m, 0.32 mm ID guard column connected to a 30 m, 0.32 mm ID, 1.0 µm Rtx®-5 column is cat.# 10254-163.

5m Guard Column ID	cat.# suffix	Additional Cost*
0.15 mm	-160	
0.18 mm	-161	
0.25 mm	-162	
0.32 mm	-163	
0.53 mm	-164	

10m Guard Column ID	cat.# suffix	Additional Cost*
0.25 mm	-165	
0.32 mm	-166	
0.53 mm	-167	

Guard columns listed are intermediate polarity (IP) deactivated.

For more information about guard columns, see **pages 20–21**.

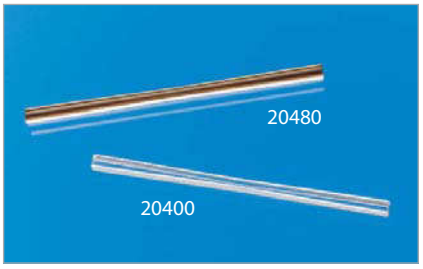
*Additional cost will be added to the price of the column.

Press-Tight® Connectors

- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek 0.1–0.53 mm ID).

Universal Press-Tight® Connectors

- Connect a guard column to an analytical column.
- Repair a broken column.
- Connect a column outlet to a transfer line.

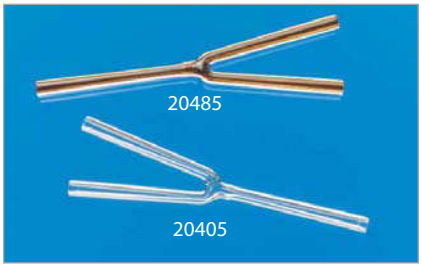


Description	5-pk.	25-pk.	100-pk.	
Universal Press-Tight Connectors	20400	20401	20402	
Universal Press-Tight Connectors, Deactivated	20429	20430	—	—
Universal Press-Tight Connectors, Siltek Deactivated	20480	20449	—	—

Universal "Y" Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

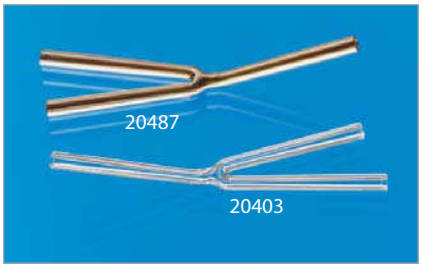
- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.



Description	ea.	3-pk.
Universal "Y" Press-Tight Connector	20405	20406
Universal "Y" Press-Tight Connector, Deactivated	20405-261	20406-261
Universal "Y" Press-Tight Connector, Siltek Deactivated	20485	20486

Universal Angled "Y" Press-Tight® Connectors

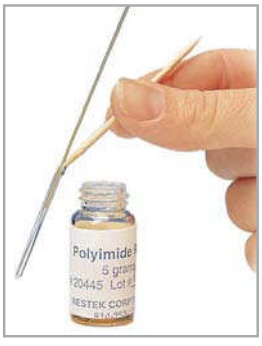
- Perform confirmation analysis with a single injection.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.



Description	ea.	3-pk.
Universal Angled "Y" Press-Tight Connector	20403	20404
Universal Angled "Y" Press-Tight Connector, Deactivated	20403-261	20404-261
Universal Angled "Y" Press-Tight Connector, Siltek Deactivated	20487	20469

Polyimide Resin

Securely connects a Press-Tight® connector to a fused silica column.



Description	Max. Temp.	qty.	cat.#
Polyimide Resin	350 °C	5 grams	20445

Fit both Restek cage designs.

Secure, reliable column-to-column connections!

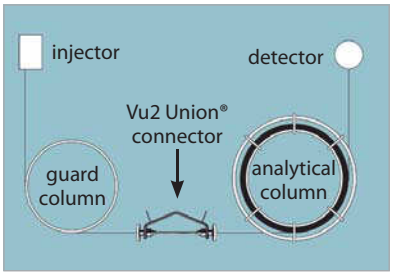
NOTE: This product is not recommended for GC column-to-MS connections.

Vu2 Union® Connectors

- Connect a guard column to an analytical column.
- Connect a column to a transfer line.
- Connect two columns in series.
- Repair a broken column.
- Fit both Restek cage designs.

Restek's Vu2 Union® connector combines the simplicity of a Press-Tight® union with the strength of a metal union.

A guard column connected to an analytical column by a Vu2 Union® connector.

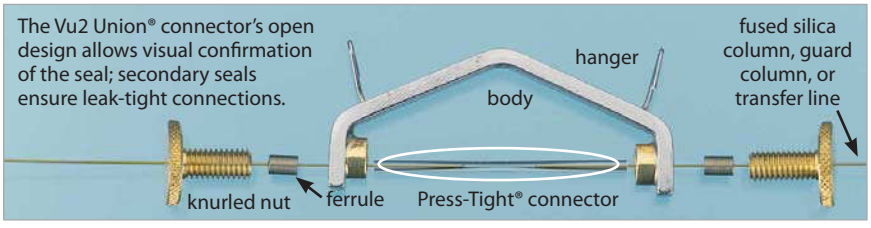


How does a Vu2 Union® connector work?

A Press-Tight® union in the Vu2 Union® connector joins the fused silica tubing ends together; the ferrule and knurled nut at each end of the connector hold the tubing in place via a secondary seal between the ferrule and the Press-Tight® union. Each knurled nut applies independent pressure to each ferrule to make leak-tight seals with the column ends. These ultra-strong connections will not unexpectedly disconnect under temperature changes, vibrations, or other stresses normally encountered in GC analyses. The open design allows visual confirmation of the seal between the column and the Press-Tight® union to ensure confidence in the connection. Hang the connector from the column cage to minimize stress on the connections.

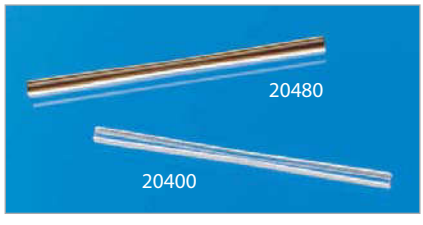
Who will benefit from using Vu2 Union® connectors?

Any analyst using guard columns, transfer lines, or restrictor tubing; performing a dual-column analysis with columns connected in series; or seeking to repair a broken column will find Vu2 Union® connectors the simple, reliable, easy-to-use solution to their connection needs.



Kits include: Vu2 Union® body, two knurled nuts, two Press-Tight® unions, and four ferrules

Description	Ferrules Fit Column ID	qty.	cat.#
Vu2 Union Connector Kit	0.10–0.15 mm	kit	22220
Vu2 Union Connector Kit	0.18–0.28 mm	kit	21105
Vu2 Union Connector Kit	0.32 mm	kit	21106
Vu2 Union Connector Kit	0.45–0.53 mm	kit	21107
Knurled Nut		2-pk.	21108



Universal Press-Tight® Connectors

Description	5-pk.	25-pk.	100-pk.
Universal Press-Tight Connectors	20400	20401	20402
Universal Press-Tight Connectors, Deactivated	20429	20430	— —
Universal Press-Tight Connectors, Siltek Deactivated	20480	20449	— —

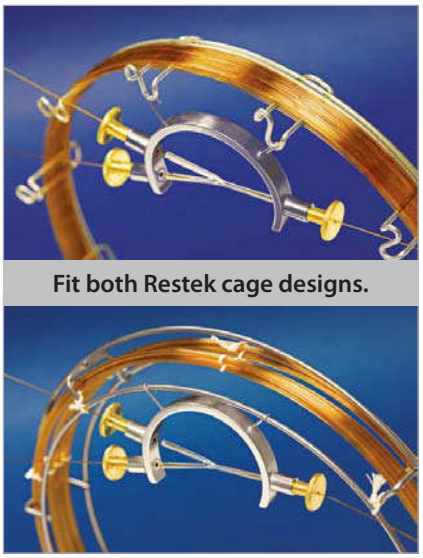
Graphite Ferrules for Vu2 Union® Connectors

- High-purity, high-density graphite.
- Stable to 450 °C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.

Ferrule ID	Fits Column ID	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	22221	22222
0.4 mm	0.18–0.28 mm	20280	20281
0.5 mm	0.32 mm	20282	20283
0.8 mm	0.45–0.53 mm	20284	20285

SeCure® "Y" Connector Kits

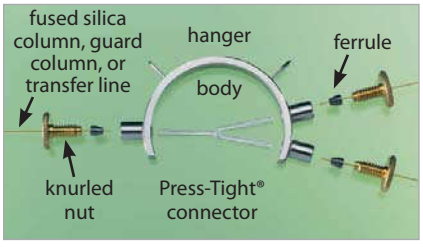
- Connect two analytical columns to a transfer line or guard column.
- Use standard "Y" Press-Tight® connectors and 1/16" graphite ferrules.
- Reliable seal integrity—will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.
- Fit both Restek cage designs.



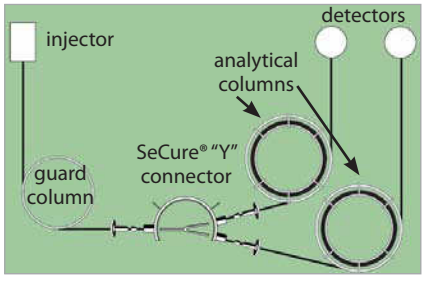
Fit both Restek cage designs.

Combine the simplicity of a "Y" Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400 °C.

The SeCure® "Y" connector's open design allows visual confirmation of the seal.



Dual-column confirmational analysis with a single injection—one of the SeCure® "Y" connector's many uses.



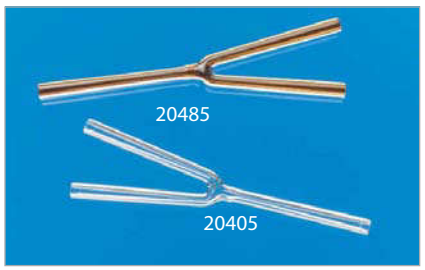
Kits include: SeCure® "Y" connector body, three knurled nuts, universal "Y" Press-Tight® union, three ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#
SeCure "Y" Connector Kit	0.18/0.25/0.28 mm	kit	20276
SeCure "Y" Connector Kit	0.32 mm	kit	20277
SeCure "Y" Connector Kit	0.45/0.53 mm	kit	20278
Knurled Nut		3-pk.	20279

Universal "Y" Press-Tight® Connectors

An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.
- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek 0.1–0.53 mm ID).



Description	ea.	3-pk.
Universal "Y" Press-Tight Connector	20405	20406
Universal "Y" Press-Tight Connector, Deactivated	20405-261	20406-261
Universal "Y" Press-Tight Connector, Siltek Deactivated	20485	20486

Graphite Ferrules for SeCure® "Y" Connectors

- Preconditioned to minimize out-gassing.
- High-purity, high-density graphite.
- Stable to 450 °C.
- No binders that can off-gas or adsorb analytes.
- Smooth surface and clean edges.

Ferrule ID	Fits Column ID	Graphite 10-pk.	Graphite 50-pk.
0.4 mm	0.10/0.15/0.18/0.25/0.28 mm	20200	20227
0.5 mm	0.32 mm	20201	20228
0.8 mm	0.45/0.53 mm	20202	20224

MXT®-Union Connector Kits for Fused Silica Columns

- Low dead volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 360 °C.
- Available in union and "Y" configurations.
- Can also be used for connecting fused silica to metal.

These MXT® connectors can be used with fused silica tubing because of a Valcon polyimide, 1/32-inch, one-piece fused silica adaptor. This unique graphite-reinforced composite allows a capillary column to slide into the adaptor and be locked in place simply by loosening and tightening the fitting.

MXT®-Union Connector Kits
for Fused Silica Columns

Each kit contains the MXT® union; two 1/32-inch nuts; and two, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Fused Silica Columns	kit	21386
For 0.32 mm ID Fused Silica Columns	kit	21385
For 0.53 mm ID Fused Silica Columns	kit	21384

MXT® "Y"-Union Connector Kits
for Fused Silica Columns

Each kit contains the MXT® union; three 1/32-inch nuts; and three, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Fused Silica Columns	kit	21389
For 0.32 mm ID Fused Silica Columns	kit	21388
For 0.53 mm ID Fused Silica Columns	kit	21387

1/32-Inch Valco® Adaptor Ferrules (Valcon Polyimide)

Fused silica adaptor ferrules are made from Valcon polyimide, a unique, graphite-reinforced composite specially prepared to maximize mechanical stability at temperatures up to 350 °C. The determining factor for selecting adaptor ferrule size is the fused silica tubing OD.

Tubing OD	Tubing ID	Valco #	qty.	cat.#
0.25–0.40 mm	0.25 mm	FS.4-5	5-pk.	20137
0.40–0.50 mm	0.32 mm	FS.5-5	5-pk.	20140
0.50–0.80 mm	0.53 mm	ZF.5V-5	5-pk.	20141
1/32" Replacement Nut			5-pk.	20389

20146

Ferrule Removal Kit

The tapered tools in this kit have teeth designed to grip and remove fused silica adaptor ferrules that have become stuck in the fitting detail. Each kit has two tools: one for removing 1/32-inch adaptor ferrules and one for removing 1/16-inch adaptor ferrules.

Description	Valco #	qty.	cat.#
Ferrule Removal Kit	FRK1	kit	20146

tech tip

Coupling GC Columns
An MXT® connector is a good alternative to a glass connector when coupling GC columns. This connector is constructed from stainless steel and will not break; it uses ferrules for sealing. The design ensures low dead volume, and Siltek® treatment ensures the MXT® connector is inert; both features help minimize peak tailing. MXT® connectors can be used to connect metal-to-metal, metal-to-fused silica, or fused silica-to-fused silica tubing. When connecting metal tubing, use 1/32-inch stainless steel ferrules (see page 214); for fused silica tubing, use Valcon polyimide adaptor ferrules (see above).

MXT® Low Dead Volume Connector Kits for Metal Columns

These low dead volume connectors are Siltek® treated to make them inert to active compounds, just like our MXT® columns. They can be used at temperatures up to 430 °C without degrading the deactivated layer. Purchase the appropriate ferrules for connecting 0.28, 0.32 or 0.53 mm ID tubing.

MXT® Low Dead Volume Connector Kits

for Metal Columns

- Connect a guard column/transfer line to an MXT® stainless steel column.
- Low thermal mass tracks rapid oven temperature programming.
- Stainless steel ferrules and nuts.
- Available in "Y" and union configurations.
- Siltek® treatment ensures ultimate inertness.

Each kit contains the MXT® union, two 1/32-inch ferrules and nuts.

Description	qty.	cat.#
For 0.28 mm ID MXT Columns	kit	20397
For 0.32 mm ID MXT Columns	kit	20536
For 0.53 mm ID MXT Columns	kit	20394

MXT® Low Dead Volume "Y" Connector Kits

for Metal Columns

Connect two MXT® columns to one inlet or one MXT® column to two detectors.

Each kit contains the MXT® union, three 1/32-inch ferrules and nuts.

Description	qty.	cat.#
For 0.28 mm ID MXT Columns	kit	20396
For 0.32 mm ID MXT Columns	kit	20537
For 0.53 mm ID MXT Columns	kit	20395

Replacement Ferrules

(1/32-Inch Stainless Steel) for MXT® Connectors

Ferrule ID	Fits Column ID	qty.	cat.#
0.59 mm	0.28 mm	10-pk.	20398
0.53 mm	0.32 mm	10-pk.	20535
0.79 mm	0.53 mm	10-pk.	20399

1/4-Inch–3/16-Inch Open-End Wrenches

High-quality miniature wrenches to use with MXT® low-dead-volume connectors.

Description	qty.	cat.#
1/4"–3/16" Open-End Wrenches	2-piece set	20388

MXT® Capillary Columns

Ideal for High Temperature GC Analysis

- Metal tubing won't become brittle at high temperatures (430 °C).
- Exclusive Siltek® layer makes the internal surface as inert as deactivated fused silica.
- Can be tightly coiled well under 4.5" without breaking, even under stress.
- Column efficiency (Trennzahl valve) is similar to that of fused silica.

See **pages 90–101.**

www.restek.com/**mxt**

20147

Zero Dead Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. 300 series stainless steel. For 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#
Internal Union	0.15 mm	ZU1XC	ea.	20147
Internal Union	0.25 mm	ZU1C	ea.	20148
Internal Union	0.75 mm	ZU1	ea.	20149
Internal Union	1/16"	ZU1T	ea.	20150


20159


20158

Male Pipe to Valco® Internal Adapter (Stainless Steel)

Makes a minimum volume connection from a female pipe fitting on a pressure gauge or regulator to a Valco® zero-dead-volume fitting. 300 series stainless steel; stainless steel ferrules included.

Description	Fitting Size	Bore	Valco #	qty.	cat.#
Male Pipe to Valco Internal Adapter	1/8" NPT Male to 1/16" ZDV	1.0 mm	PZA21	ea.	20158
Male Pipe to Valco Internal Adapter	1/4" NPT Male to 1/16" ZDV	1.0 mm	PZA41	ea.	20159


20286


20287

Nuts & Ferrules

(1/16-Inch Stainless Steel) for Valco® Connectors

Description	Valco #	qty.	cat.#
Ferrules, 1/16" Stainless Steel	ZF1-10	10-pk.	20286
Nuts, 1/16" Stainless Steel	ZN1-10	10-pk.	20287


21015

1/16-Inch Valco® Adaptor Ferrules

Fused silica adaptor ferrules are made from Valcon polyimide, a unique, graphite-reinforced composite specially prepared to maximize mechanical stability at temperatures up to 350 °C. The determining factor for selecting adaptor ferrule size is the fused silica tubing OD.

		Valcon Polyimide			Polyimide		
Tubing OD	Tubing ID	Valco #	qty.	cat.#	qty.	cat.#	
0.25–0.4 mm	0.1-0.25 mm	FS1.4-5	5-pk.	20142	2-pk.	21015	
0.4–0.5 mm	0.32 mm	FS1.5-5	5-pk.	20143	2-pk.	21016	
0.5–0.8 mm	0.53 mm	FS1.8-5	5-pk.	20144	—	—	—
0.8 mm (1/32")	—	FS1.9-5	5-pk.	20145	—	—	—


22241

Viton® O-Rings for Agilent GCs

Fit split (6.3 mm OD) or splitless (6.5 mm OD) liners.

Description	Max. temp.	Similar to Agilent part #	10-pk. cat.#	50-pk. cat.#
Viton O-Rings for Agilent GCs	300 °C	5188-5365	22241	22242


20296

Graphite O-Rings for Agilent and Bruker/Varian 1177 Injectors

Excellent thermal stability at injection port temperatures up to 450 °C!

Description	Max. temp.	Similar to Agilent part #	10-pk. cat.#	50-pk. cat.#
6.35 mm ID Graphite O-Rings for split liners	450 °C	5180-4168	20296	20297
6.5 mm ID Graphite O-Rings for splitless liners	450 °C	5180-4173	20298	20299


22336

Replacement Viton® O-Rings for use with the Agilent Flip Top Inlet Sealing System

Description	Similar to Agilent part #	qty.	cat.#
Viton Replacement O-Rings for use with the Agilent Flip Top Inlet Sealing System	5188-5366	10-pk.	22336


21409

Silver PTV Seals for Agilent 6890 GCs

Description	Similar to Agilent part #	qty.	cat.#
Silver PTV Seals for Agilent 6890 GCs	5182-9763	5-pk.	21409


22684

Liner Seals for CIS4 and PTV

Description	Max. temp.	Similar to Agilent part #	Similar to Gerstel part #	qty.	cat.#
Liner Seals for CIS4 and PTV	450 °C	5182-9749	007541-005-00	5-pk.	22684


22352

22349


21409


Inlet Adaptor

PTV Inlet Adaptor Kit for Gerstel CIS 3 and CIS 4 PTV Inlets

- Meets original manufacturer's performance.
- Includes inlet adaptor, silver PTV seal, and slotted capillary nut.

Description	Similar to Gerstel part #	qty.	cat.#
PTV Inlet Adaptor Kit for 0.25 and 0.32 mm ID Columns	007259-045-00	kit	22350
PTV Inlet Adaptor Kit for 0.53 mm ID Columns	007259-007-00	kit	22351
Silver PTV Seals	002841-005-00	5-pk.	21409
PTV Slotted Capillary Column Nut	001268-005-00	2-pk.	22349
Liner Seal Pre-Seat Tool	007542-000-00	ea.	22352


22223

GRAPHPACK® 2m Ferrules for Gerstel CIS 3 and CIS 4 PTV Inlets

Fits Column ID	Similar to Gerstel part #	qty.	cat.#
0.25 mm	001805-040-00	10-pk.	22223
0.32 mm	001805-045-00	10-pk.	22224
0.53 mm	001805-007-00	10-pk.	22225

Supplies for Agilent GCs: Inlet

22810

22811

22813

22814

22812

22782

22809

Merlin Microseal Septa for Agilent GCs

- Allow operation from 3 to 100 psi (general-purpose Microseal septa) or 1 to 45 psi (low-pressure Microseal septa).
- 400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring, longer life, and consistent, low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. No adapter is required for the Agilent inlet. Installation is simple, requiring no modification of the injection port.

Description	Merlin #	Similar to Agilent part #	qty.	cat.#
General Purpose Kit for Agilent GCs (3 to 100 psi)				
Nut & 2 General Purpose (#410) Microseals	404	5181-8833	kit	22810
Nut & 1 General Purpose (#410) Microseal	405	5182-3442	kit	22811
Low Pressure Kit for Agilent GCs (1 to 45 psi)				
Nut & 2 Low Pressure (#310) Microseals	304		kit	22813
Nut & 1 Low Pressure (#310) Microseal	305	5181-8816	kit	22814
Replacement Microseals				
General-Purpose Microseal (most applications, 3 to 100 psi)	410	5182-3444	ea.	22812
Low-Pressure Microseal (1 to 45 psi)	310	5181-8815	ea.	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W		ea.	22782
Replacement Microseal Nut	403	5182-3445	ea.	22809

Note: Merlin Microseal septa require a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Compatible syringes and replacement needles are available at www.restek.com.

NEW!

22226

Merlin MicroShot™ Injector

- NIST traceability assures accurate injections.
- Fixed volume reduces sampling error.
- Saves time—no need to transfer to autosampler vials.
- Prevents bent syringe plungers.
- Five injection volumes available.*

Increase the accuracy and reproducibility of manual injections with the Merlin MicroShot™ injector. This new injector is calibrated to NIST reference standards to assure accurate and traceable displacement. Precise repeated injections of the preset volume can be made using a standard autosampler syringe with less variation than when injecting by hand. The trigger mechanism provides rapid sample delivery, which reduces needle residence time in the injection port and minimizes potential sample discrimination.

The Merlin MicroShot™ injector allows convenient sampling from a wide variety of containers, so you can save time by eliminating the need to transfer aliquots into autosampler vials. The design of this unit also includes a plunger support, which protects the syringe plunger and prevents it from bending.

Fits Agilent-style (ball-end plunger) autosampler syringes with either fixed or removable, 23- or 26-gauge needles.

Description	Merlin cat.#	qty.	cat.#
0.1 µL injection volume	701-01	ea.	22226
0.2 µL injection volume	701-02	ea.	22227
0.5 µL injection volume	701-05	ea.	22228
1.0 µL injection volume	701-10	ea.	22229
2.0 µL injection volume	701-20	ea.	22230

*Syringe not included. Requires Agilent-style (ball-end plunger) autosampler syringe.


Thermolite® Septa


Premium Non-Stick BTO® Septa

NEW!

Septa for Agilent GCs

- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs.

Septum Diameter	50-pk.	100-pk.
Thermolite Septa (usable to 340 °C inlet temp.)		
5 mm (3/16")	27121	27122
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143
Premium Non-Stick BTO Septa (usable to 400 °C inlet temp.*)		
5 mm CenterGuide	27082	27083
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091

*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.
Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

HANDY septum size chart

Agilent Instrument	Septum Diameter (mm)
5880A, 5890, 6890, 6850, 7890, PTV	11
5700, 5880	9.5/10
On-Column Injection	5

Septum Puller

- Use hooked end for removing septa and O-rings; pointed end for removing stuck ferrules or debris.
- Keep several on hand in your laboratory for other uses, too.


Dislodge a stuck ferrule quickly and easily—without scoring the fitting.


Remove a septum without damaging an expensive weldment.


20117

Description	qty.	cat.#
Septum Puller	ea.	20117


21309

Septum Nuts for use with Agilent 5890/6890/6850/7890 Split/Splitless Injectors

- Needle guide allows easy penetration and prevents septum coring.
- Manual injection septum nut allows use of 26-gauge needles for on-column injections.
- Made of high-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#
Septum Nut, Autosampler & PTV (for 23-gauge needles)	18740-60835	ea.	20631
Septum Nut, Manual Injection (for 26-gauge needles)	18740-60835	ea.	21309

Septum Nut Removal Tool

for Agilent 5890/6890/6850/7890 GCs

- Easily remove the septum nut without touching the heated nut—no more burned fingers!
- Unique, ergonomic handle—easy to grip.
- Nut remains in tool for quick reattachment.


24918


Slip tool over septum nut...


loosen nut...


and remove, avoiding hot metal surfaces.


Septum nut remains in tool until reinstalled.

Description	qty.	cat.#
Septum Nut Removal Tool for Agilent 5890/6890/6850/7890 GCs	ea.	24918

22065

Injector Wrench for Agilent 5890/6890/6850 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.

Description	Similar to Agilent part #	qty.	cat.#
Injector Wrench for Agilent 5890/6890/6850 GCs	19251-00100	ea.	22065

21393

Injection Port Repair Tool
for Agilent Split/Splitless Injection Ports

- Remove contaminants, achieve a better seal.
- Cleans critical inlet seal areas.

Description	qty.	cat.#
Injection Port Repair Tool for Agilent Split/Splitless Injection Ports	ea.	21393
Replacement Sanding Disks (5 fine & 5 medium)	10-pk.	22689
Replacement Bore Brushes (one 6.5 mm & one 7 mm)	2-pk.	21353

Rethreading Tool
for Agilent Split/Splitless Injection Ports

Worn and damaged threads can allow oxygen into the system—compromising analytical results and destroying columns. The built-in guide helps prevent cross-threading.

23018

Repair damaged injection port threads!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool	ea.	23018

22181

Inlet Maintenance Kit for Agilent GCs

- Includes the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

Inlet kit includes:

- 0.4, 0.5, and 0.8 mm ID graphite ferrules
- Viton® O-rings
- Capillary nuts
- Inlet seals
- Reducing nut
- Scoring wafer
- 11 mm Thermolite® septa
- 4.0 mm single taper liner
- 4.0 mm split liner with wool
- Capillary column caps
- 1/4" x 5/16" wrench
- Septum puller
- Installation gauge
- Wire cleaning brush
- Jet reamers/ferrule removers
- Inlet liner removal tool
- Septa nut removal tool

Description	qty.	cat.#
Inlet Maintenance Kit	kit	22181

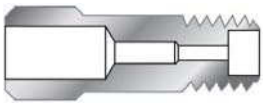

Stainless Steel


Brass

Capillary Column Nuts for Agilent 5890/6890/7890 GCs

Available in brass or stainless steel.


Choose for use with "compact" Agilent-style ferrules...


...or for use with standard ferrules.

Description	Similar to Agilent part #	qty.	cat.#
For use with "compact" Agilent-style ferrules.			
Stainless Steel Capillary Column Nut	5181-8830	2-pk.	21884
Brass Capillary Column Nut	5181-8830	2-pk.	21878
For use with standard 1/16"-type ferrules.*			
Stainless Steel Capillary Column Nut	05921-21170	2-pk.	20883
Brass Capillary Column Nut	05921-21170	2-pk.	21879

*Designed to fit a wider variety of 1/16" ferrules


22347

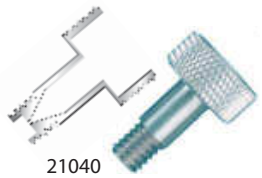
Hot Swap Capillary Column Nuts

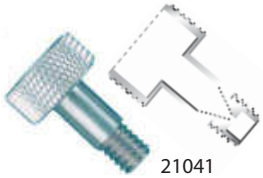
- No more burned fingers!
- No more downtime waiting for injector parts to cool down.

Never worry again about burned fingers or having to wait for the injector to cool down. The Hot Swap capillary column nut allows you to change your capillary column while the injector temp is still hot.

Description	qty.	cat.#
For use with "compact" Agilent-style ferrules.		
Hot Swap Capillary Column Nut	ea.	22348
For use with standard 1/16"-type ferrules.		
Hot Swap Capillary Column Nut	ea.	22347

NOTE: For proper operation, oven fan must be kept operational during change out or risk of burn may occur.


21040


21041

Finger-Tight Capillary Column Nuts

- Allow wrench-free column installations.
- Work with standard or compact (Agilent-style) ferrules.
- Made from high-quality stainless steel.

Description	Similar to Agilent part #	qty.	cat.#
For use with "compact" Agilent-style ferrules.			
Finger-Tight Capillary Column Nuts	5020-8293, 5020-8292	2-pk.	21040
For use with standard 1/16"-type ferrules.			
Finger-Tight Capillary Column Nuts	5020-8293, 5020-8292	2-pk.	21041


21883

Injector/Detector Plug Nuts

- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.

Description	Similar to Agilent part#	qty.	cat.#
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883


21034


21399

Easily seat ferrules for consistent installations!

Capillary Installation Gauge for Agilent GCs

- Seats graphite* ferrules onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399

*For use with graphite ferrules only.

Patented

Dual Vespel® Ring Inlet Seals Washerless, leak-tight seals for Agilent GCs

- Does not require a separate washer.
- Requires less torque to seal.
- Does not require retightening of reducing nut after several oven cycles.
- Extends column lifetime by preventing oxygen from reaching the column.
- Same price as the regular inlet seals with washers.

Extend your column lifetimes!

21238 21240 21248

0.8 mm ID Dual Vespel Ring Inlet Seal	2-pk.	10-pk.	50-pk.
Gold-Plated	21240	21241	23418
Siltek-Treated	21242	21243	23419
Stainless Steel	21238	21239	23420
1.2 mm ID Dual Vespel Ring Inlet Seal	**2-pk.**	**10-pk.**	
Gold-Plated	21246	21247	
Siltek-Treated	21248	21249	
Stainless Steel	21244	21245	

22083

22085

Dual Vespel® Ring Cross-Disk Inlet Seals for Agilent GCs

- Ideal for high-flow split applications.
- Washerless, leak-tight seals.

0.8 mm ID Dual Vespel Ring Cross-Disk Inlet Seal	2-pk.	10-pk.
Gold-Plated	22083	22084
Siltek-Treated	22085	22086

restek innovation!

1/16" Adaptor Fitting

Patented.

Flip Seal® Dual Vespel® Ring Inlet Seals

- Reversible, two-sided design allows significantly more analyses than other seals, at the same price—simply use, flip, then use again!
- Vespel® ring embedded in top and bottom surface eliminates need for a washer.
- Highly inert gold or Siltek®-deactivated seals reduce breakdown and adsorption of active compounds, maximizing component transfer to GC column.
- Very little torque required to make seal—reduces operator variability.

Flip Seal Dual Vespel Ring Inlet Seal	2-pk.	10-pk.
Gold-Plated	23411	23413
Siltek-Deactivated	23412	23414

Flip Seal Dual Vespel Ring Inlet Seal Kit	qty.	cat.#
Includes: gold-plated inlet seal, reducing nut adaptor, 1/16" SS nut	kit	23406

Note: The Flip Seal® inlet seal requires a special reducing nut adaptor fitting, which is included in the kit. The Flip Seal® Adaptor can be used with standard 1/16" ferrules.

Replacement Inlet Seals With Washers

- Siltek® treatment provides inertness similar to fused silica.
- All seals include washers.

Replacement Inlet Seals for Agilent GCs

The inlet seal at the base of the Agilent 5890/6890/7890 GC injection port contacts the sample and must be changed frequently to prevent adsorption of active compounds. In addition, septum fragments and sample residue accumulate on the disk surface, requiring disk replacement.

To reduce breakdown and adsorption of active compounds, use Siltek® or gold-plated seals.

Single-Column Installation 0.8 mm ID (Opening)	Similar to Agilent part #	2-pk.	10-pk.	50-pk.
Gold-Plated	5188-5367	21317	21318	23415
Siltek-Treated		21319	21320	23416
Stainless Steel	18740-20880	21315	21316	23417
0.25/0.32 mm ID Dual-Column Installation **1.2 mm ID (Opening)**		**2-pk.**	**10-pk.**	
Gold-Plated		21305	21306	
Siltek-Treated		21307	21308	
Stainless Steel		20390	20391	
0.53 mm ID Dual-Column Installation **1/16-inch ID (Opening)**		**2-pk.**	**10-pk.**	
Stainless Steel		20392	20393	

Note: The 1.2 mm inlet seal is recommended when installing two columns using a two-hole Vespel®/graphite ferrule.

All seals include washers.

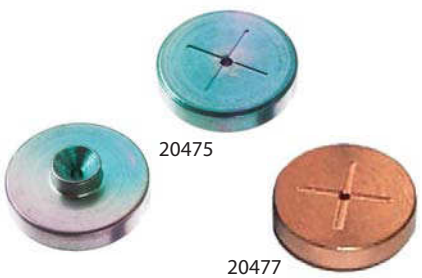
Replacement Inlet Seal Washers

Description	Similar to Agilent part #	qty.	cat.#
Replacement Inlet Seal Washers	5061-5869	15-pk.	21710

Cross-Disk Inlet Seals for Agilent GCs

- Ideal for high-flow split applications on Agilent 5890 GCs.
- All seals include washers.

0.8 mm ID Cross-Disk Inlet Seal	Similar to Agilent part #	2-pk.	10-pk.
Gold-Plated	5182-9652	20477	20476
Siltek-Treated	—	20475	20474
1.2 mm ID Cross-Disk Inlet Seal	**Similar to Agilent part #**	**2-pk.**	**10-pk.**
Gold-Plated	—	21009	21010
Siltek-Treated	—	21011	21012



Silver PTV Seals for Agilent 6890 GCs

Description	Similar to Agilent part #	qty.	cat.#
Silver PTV Seals for Agilent 6890 GCs	5182-9763	5-pk.	21409

restek innovation!

EZ Twist Top® Split/Splitless Injection Ports for Agilent GCs

- Change inlet liners faster and more easily.
- Gas lines are attached to shell weldment bottom to help eliminate broken gas lines.
- Gas lines don't interfere with routine maintenance.
- Weldment removal tool allows for quick removal of the hot weldment without fingers ever touching hot surfaces.
- Weldment stays secure in the tool for reattachment.

The importance of injection port maintenance has been well documented by instrument and column companies industry wide. Restek has made it easy to carry out this maintenance with the innovation of our EZ Twist Top® injection port.

Simply slip the weldment removal tool over the weldment, then twist and remove the weldment. For speed and efficiency, the weldment stays secured in the weldment removal tool until you reattach it.

Get the EZ Twist Top Advantage	Restek EZ Twist Top	Agilent Flip Top
Eliminate damaged gas lines	x	
Siltek deactivation for enhanced inertness & durability	x	
Avoid touching hot metal surfaces—weldment tool included	x	

EZ Twist Top® Split/Splitless Injection Port for Agilent 7890 GCs

Description	qty.	cat.#
Injection Port Assembly Kit Includes: weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22177
Injection Port Assembly Kit, Siltek Treated Includes: Siltek weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22178
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22175
Shell Weldment, Siltek Treated	ea.	22176
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk. 10-pk.	21242 21243
Weldment Removal Tool	ea.	22728

Visit www.restek.com/slideshows for an educational video on our EZ Twist Top® injection port system.

tech tip

Which EZ Twist Top® injection port should you buy?

The type of split vent trap you have connected to the EPC module/block on your 6890/6850 Agilent GC determines which EZ Twist Top® Injection Port you need to buy.

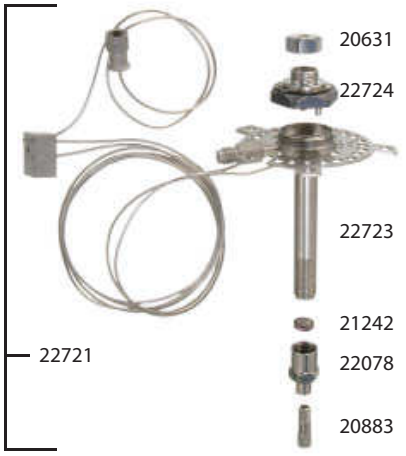
Simply remove the top and rear panel on the GC and see if you have the small (pencil type) split vent filter (cat.# 22820) or the large canister type filter (cat.# 23031) attached to the split vent gas line. If you have the small (pencil type) split vent filter, you need the EZ Twist Top® Injection Port for Agilent 6890/6850 GCs (cat.# 22721 or 22722). If you have the large canister filter, you'll need the EZ Twist Top® with Optional Split Vent for Agilent 6890/6850 GCs, for use with large canister type filters (cat.# 22735 or 22736).

EZ Twist Top® Split/Splitless Injection Port
for Agilent 6890/6850 GCs (for use with large canister type filter)

Description	qty.	cat.#
Injection Port Assembly Kit Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22735
Injection Port Assembly Kit, Siltek Treated Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22736
Optional Split/Splitless Shell Weldment	ea.	22733
Optional Split/Splitless Shell Weldment, Siltek Treated	ea.	22734

EZ Twist Top® Split/Splitless Injection Port
for Agilent 6890/6850 GCs with Pencil Traps

Description	qty.	cat.#
Injection Port Assembly Kit Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22721
Injection Port Assembly Kit, Siltek Treated Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22722
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22723
Shell Weldment, Siltek Treated	ea.	22730
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk. 10-pk.	21242 21243
Weldment Removal Tool	ea.	22728



EZ Twist Top® Split/Splitless Injection Port for Agilent 5890 GCs

Description	qty.	cat.#
Injection Port Assembly Kit Includes: split/splitless weldment, shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22725
Injection Port Assembly Kit, Siltek Treated Includes: Siltek split/splitless weldment, Siltek shell weldment, 2 weldment O-rings, Siltek dual Vespel ring inlet seal, septum nut, reducing nut, stainless steel capillary nut for use with 1/16" ferrules, and weldment removal tool	kit	22726
Weldment (2 weldment O-rings are installed on the weldment)	ea.	22724
Weldment, Siltek Treated (2 weldment O-rings are installed on the weldment)	ea.	22732
Shell Weldment	ea.	22727
Shell Weldment, Siltek Treated	ea.	22731
Weldment O-rings	10-pk.	22729
Septum Nut, Autosampler & PTV (for 23-gauge needles)	ea.	20631
Stainless Steel Capillary Column Nut (for use with standard 1/16" ferrules)	2-pk.	20883
Reducing Nut	ea.	22078
0.8 mm Dual Vespel Ring Inlet Seal, Siltek-Treated	2-pk. 10-pk.	21242 21243
Weldment Removal Tool	ea.	22728

Supplies for Agilent GCs: Injection Port

Split/Splitless Injection Ports for Agilent GCs

Would you like better performance from your injector? Our Siltek®-treated split/splitless injector is a direct replacement for Agilent 5890 and 6890/6850 GCs, but Siltek® treatment passivates the metal surface to ensure an inert pathway for the sample, delivering increased performance. The injector is manufactured from high-quality stainless steel and meets or exceeds Agilent original equipment performance.


20265


20266

Split/Splitless Injection Port

(Direct Replacement or Siltek® Treated) for Agilent 5890 GCs

Description	Similar to Agilent part #	qty.	cat.#
Replacement Weldment*	19251-60575	ea.	20265
Replacement Weldment*, Siltek Treated	19251-60575	ea.	20267
Replacement Shell Weldment	19251-80570	ea.	20266
Replacement Shell Weldment, Siltek Treated	19251-80570	ea.	20268

*For use with manual flow or EPC on Agilent 5890 GCs. For use with manual flow only on Agilent 6890/6850 GCs.


22674


22686


20265


22673

Split/Splitless Injection Port

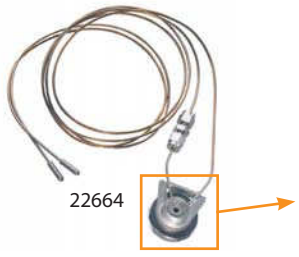
(Direct Replacement or Siltek® Treated) for Agilent 6890/6850 GCs

Description	Similar to Agilent part #	qty.	cat.#
Replacement Weldment with EPC	G1544-60575	ea.	22674
Replacement Weldment with EPC, Siltek Treated	G1544-60575	ea.	22672
Replacement Weldment*	19251-60575	ea.	20265
Replacement Weldment*, Siltek Treated	19251-60575	ea.	20267
Replacement Shell Weldment	G1544-80570	ea.	22673
Replacement Shell Weldment, Siltek Treated	G1544-80570	ea.	22671
Split/Splitless Weldment (for use with large canister type filter)	G1544-60585	ea.	22686
Split/Splitless Weldment (for use with large canister type filter), Siltek Treated	G1544-60585	ea.	22670

*For use with manual flow or EPC on Agilent 5890 GCs. For use with manual flow only on Agilent 6890/6850 GCs.

Injection Port Weldments for Agilent GCs for Use With Purge and Trap Systems

Easily attach your purge and trap with pre-installed low dead volume fittings.


22664

Injection Port Weldments

for Agilent GCs with Tekmar Purge and Trap Systems

Description	qty.	cat.#
Weldment for Agilent 6890 GCs	ea.	22664
Weldment for Agilent 6890 GCs with large canister type filter	ea.	22668
Weldment for Agilent 5890 GCs	ea.	22666


22665

Injection Port Weldments

for Agilent GCs with OI Purge and Trap Systems

Description	qty.	cat.#
Weldment for Agilent 6890 GCs	ea.	22665
Weldment for Agilent 6890 GCs with large canister type filter	ea.	22669
Weldment for Agilent 5890 GCs	ea.	22667


27184

1/16-Inch Capillary Inlet Adaptor Fitting Kit
(Split/splitless fitting for capillary columns)

- 1/16-inch split/splitless fitting that accepts standard capillary ferrules.
- Easier to install capillary columns because the nut protrudes farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, capillary nut, gold-plated 0.8 mm ID dual Vespel® ring inlet seal, and one 0.4 mm ID ferrule.

Description	qty.	cat.#
1/16-Inch Capillary Inlet Adaptor Fitting Kit	kit	27184
0.8 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21240
	10-pk.	21241


22078

Direct Replacement Reducing Nut
- Made from high-quality stainless steel.
- Meets original manufacturer's equipment performance.

Description	Similar to Agilent part #	qty.	cat.#
Reducing Nut	18740-20800	ea.	22078


24323

EPC Test Kit for Agilent 6890 GCs
Kit includes three O-rings, two plugs, one mounting screw, and one test block.

Description	Similar to Agilent part #	qty.	cat.#
EPC Test Kit for Agilent 6890 GCs	G1530-60960*	kit	24323

*Similar to Agilent part # G1530-60960, but not exact equivalent. Kits differ in parts.

Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs
- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	kit	22068
Injector/FID Heater	19231-60620	ea.	22069
Injector/FID PRT Sensor	19231-60660	ea.	23035


20409

Heat Sink
for Agilent 5890 GC Split/Splitless Injector

Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Heat Sink	18740-20940	ea.	20409

NEW!


27199

Heater Block
for Agilent 6850/6890/7890 GC Split/Splitless Injector

Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Heater Block	G3452-20500, G1544-20570	ea.	27199

Supplies for Agilent GCs: Replacement Parts

NEW!

Heater/Sensor Assembly for Agilent 6850/6890/7890 GCs

- Use with FID, TCD, NPD, and split/splitless inlets.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Heater/Sensor Assembly	G1530-61950	ea.	27200

Heater Block Retaining Nuts for Agilent GC Split/Splitless Injectors

- Aluminum construction.
- Meet or exceed manufacturer's performance.

23042

Description	Similar to Agilent part #	qty.	cat.#
Heater Block Retaining Nut for Agilent 5890 GCs	19251-20620	ea.	22080
Heater Block Retaining Nut for Agilent 6890/6850 GCs	G1544-20590	ea.	23042

Oven Temperature Sensor Assembly for Agilent GCs

Description	Similar to Agilent part #	qty.	cat.#
Oven Temperature Sensor for Agilent 5890 GC	05890-61030	ea.	23040
Oven Temperature Sensor for Agilent 6890 GC	G1530-61030	ea.	23039

60 psig Backpressure Regulator Kit for Agilent GCs

Increase the versatility of your Agilent 5890 GC by replacing the existing 30 psig (207 kPa) backpressure regulator and gauge with our 60 psig (414 kPa) regulator. Enables you to use longer 60 m and 105 m columns as well as shorter 10 m columns. Includes complete instructions.

Description	Similar to Agilent part #	qty.	cat.#
Backpressure Regulator Kit	19246-60630	kit	20634

22820

23032

Replacement Chemical Traps for Agilent GCs

- Easy to install.
- Attach to same fittings as original manufacturer's equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent part #	qty.	cat.#
Replacement Split Vent Trap for Agilent 6890/6850 GCs	G1544-80550	ea.	22820
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610
Split Vent Line (32-inch) for Agilent GCs Includes: all installation hardware	19251-80525	2-pk.	22800
O-Rings for Agilent Trap Fittings	5180-4181	25-pk.	22064
Optional Split Vent Trap Assembly for Agilent 6890/6850 GCs	G1544-60610	kit	23031
Replacement Traps (2) and O-Rings (4)	G1544-80530	kit	23032

Air Diverter for Agilent GCs

- Divert GC exhaust heat up and away from the lab bench.
- Meets or exceeds original manufacturer's performance.
- Easy to install—no tools required.
- Compatible with 4" flexible metal dryer hose.

Description	Similar to Agilent part #	qty.	cat.#
Air Diverter for Agilent 5890/6890/7890 GCs	19247-60510, G1530-80650	ea.	22076

Injector Wrench

for Agilent 5890/6890/6850 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.

22065

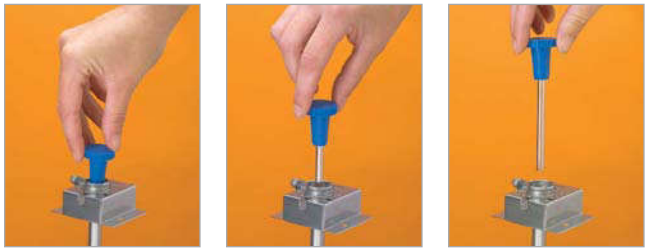
Description	Similar to Agilent part #	qty.	cat.#
Injector Wrench for Agilent 5890/6890/6850 GCs	19251-00100	ea.	22065

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

20181

No more burned fingers!



Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

Rethreading Tool

for Agilent Split/Splitless Injection Ports

Worn and damaged threads can allow oxygen into the system—compromising analytical results and destroying columns. The built-in guide helps prevent cross-threading.

23018

Repair damaged injection port threads!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool	ea.	23018

26262

The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.

Description	qty.	cat. #
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658

Supplies for Agilent GCs: Tools, Packed Column

Everything you need in one complete kit!

22186

Make Life Easier (MLE) Capillary Tool Kit for Agilent GCs

Includes:

- Capillary installation gauge for Agilent GCs
- Injector wrench for Agilent GCs
- Septum nut removal tool
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit for Agilent GCs	kit	22186

Column Hanger

for Agilent 7890, 6890, 5890, and 5880A GCs

Description	qty.	cat. #
Column Hanger for Agilent 7890, 6890, 5890, and 5880A GCs	ea.	22128

22128

Direct Injection (DI) Inserts and Liner Adaptor for 1/4-Inch Packed Column Injection Ports (for 0.25, 0.32, & 0.53 mm ID columns)

DI Glass Inserts for Agilent 5890 Packed Column GC

- Tolerances closely controlled.
- Can be removed from the septum nut weldment.

Description	Similar to Agilent part #	qty.	cat.#
DI Glass Inserts for Agilent 5890 Packed Column GC (1.7 mm ID x 3.0 mm OD x 93 mm)	5181-3382, 5080-8732	5-pk.	20967

DI Uniliner® Liners for Agilent 5890 Packed Column GC

- Press-Tight® taper forms dead volume free connection to column.
- Minimizes solvent and peak tailing.
- Use with 0.25, 0.32, and 0.53 mm ID capillary columns.
- Can be removed from the septum nut weldment.

Description	Fits same liner adaptor as Agilent part #	qty.	cat.#
DI Uniliner Liner for Agilent 5890 Packed Column GC (1.7 mm ID x 3.0 mm OD x 93 mm)	5181-3382, 5080-8732	ea.	20964
		5-pk.	20965
		25-pk.	20966

DI Liner Adaptor

for Agilent 5890 Packed Column GC

- Uses standard 1/16-inch capillary nut and ferrules.
- Convenient wrench pad at base.
- Includes 1/4-inch graphite ferrule and stainless steel nut.
- Use with Agilent or Restek DI glass inserts or Restek DI Uniliner® liners for an Agilent 5890 packed column GC.

Description	Similar to Agilent part #	qty.	cat.#
DI Liner Adaptor for Agilent 5890 Packed Column GC	19244-80540	ea.	21303

Siltek® Septum Packed Purge Port Weldment for Agilent 5890 GCs

Siltek® treatment makes weldment inert and eliminates adsorption of sensitive compounds (e.g., DDT and endrin). Order Viton® O-rings (below) and appropriate septa separately (see page 217).

Description	Similar to Agilent part #	qty.	cat.#
Siltek Septum Packed Purge Port Weldment for Agilent 5890 GCs	19243-80570	ea.	21691
Viton Replacement O-rings	5080-8898	10-pk.	21685

Micropacked Inlet Conversion Kits

- Convert a capillary GC split/splitless inlet for use with 1/16" OD micropacked columns.
- For use with Agilent 5890, 6890, and 7890 GCs.
- Sample pathways deactivated for ultimate inertness.

Description	qty.	cat.#
Micropacked Column Adaptor Kit for Split/Splitless Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); 4 mm splitless liner, intermediate polarity deactivated; 1/16" nuts, stainless steel (2)	kit	22424
Micropacked Column Adaptor Kit for On-Column Injection* *Complete kit with FID and injection port adaptors* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" ferrules, Vespel/graphite (2); Siltek treated metal liner installation guide; 1/16" nuts, stainless steel (2)	kit	22425
Micropacked Column Adaptor Kit for Split/Splitless Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; 1/16" nut, stainless steel; 4 mm splitless liner, intermediate polarity deactivated	kit	22426
Micropacked Column Adaptor Kit for On-Column Injection *Injection Port Adaptor Kit* Kit includes: dual Vespel ring inlet seal, large bore; reducing nut, large bore; 1/16" ferrule, Vespel/graphite; Siltek treated metal liner installation guide; 1/16" nut, stainless steel	kit	22427
Micropacked Column Adaptor Kit for FID* *FID Adaptor Kit* Kit includes: FID adaptor, large bore; 1/4" ferrule, Vespel/graphite; 1/4" nut, stainless steel; 1/16" nut, stainless steel; 1/16" ferrule, Vespel/graphite	kit	22428
Replacement Inlet Seals for Micropacked Column Adaptor Dual Vespel Ring Inlet Seals, large bore (2)	2-pk.	22429
Replacement Metal Liner Installation Guide for On-Column Injection, Siltek Treated	ea.	22430
Replacement 4 mm Splitless Liner	ea.	20772

*For use with packed column FIDs only.



Large-Bore Dual Vespel® Ring Inlet Seals


1/4" SS Nut


Large-Bore FID Adaptor


1/4" Vespel®/Graphite Ferrule


1/16" SS Nuts


Large-Bore Reducing Nut


1/16" Vespel®/ Graphite Ferrules


22430


20772

27185

Inlet Adaptor Kit for Dual Column Installation

for Agilent Capillary Injectors (Split/splitless fitting for capillary columns)

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2 mm ID dual Vespel® ring inlet seal, one 0.4 mm ID two-hole ferrule, and one 0.5 mm ID two-hole ferrule.

Description	qty.	cat.#
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185
1.2 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21246
	10-pk.	21247

20645

For use with 0.53 mm ID columns.

1/8-Inch Capillary Inlet Adaptor Fitting Kit

(Split/splitless fitting for 0.53 mm ID capillary columns)

- 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut.
- Makes column installation easy due to the nut protruding farther from the insulated injection port chamber.
- The column insertion depth is the same as the original equipment.
- Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8 mm ID two-hole ferrule.
- Use recessed taper liners with this adaptor.

Description	qty.	cat.#
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645
0.53 mm ID Dual-Column Installation	2-pk.	20392
1/16-inch ID (Opening) Replacement Inlet Seal	10-pk.	20393

Two-Hole Ferrules

for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespel/Graphite
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

EZ No-Vent® GC Column-Mass Spectrometer Connector

for Agilent GCs with 5971/5972, 5973, or 5975 GC-MS

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and eliminates the need to vent.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers' vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of down-time with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.

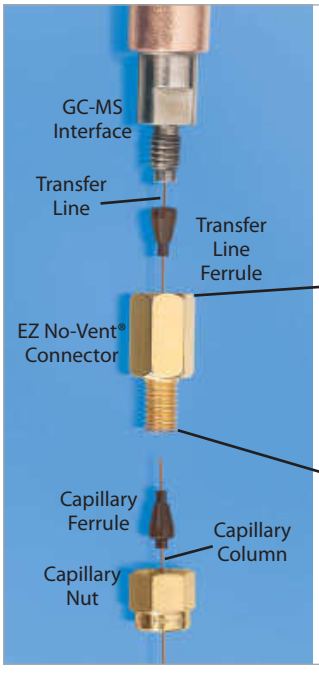


Figure 1: The EZ No-Vent® connector incorporates a laser-machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases as in other manufacturers' systems.

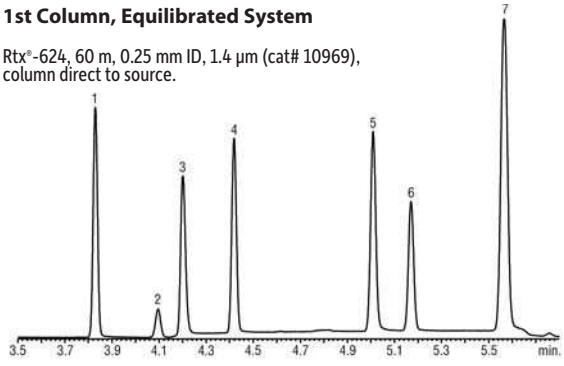
Laser drilled to 100 µm ID

Change columns in minutes—without venting!

Figure 2: Sharp, symmetric peaks for gases show the EZ No-Vent® connector does not add dead volume and allows rapid column changes.

1st Column, Equilibrated System

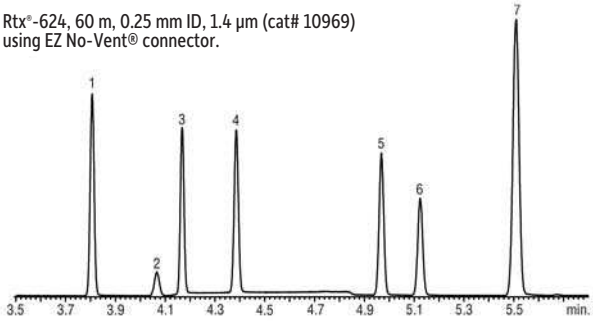
Rtx®-624, 60 m, 0.25 mm ID, 1.4 µm (cat# 10969), column direct to source.



GC_EV00659a

Acquired 76 minutes after installing 2nd column

Rtx®-624, 60 m, 0.25 mm ID, 1.4 µm (cat# 10969) using EZ No-Vent® connector.



GC_EV00659b

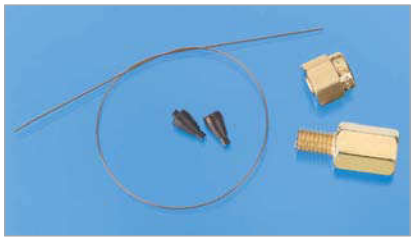
Peaks

1. Dichlorodifluoromethane
2. 1,2-dichlorotetrafluoroethene (Freon® 114)
3. Chloromethane
4. Vinyl chloride
5. Bromomethane
6. Chloroethane
7. Trichlorofluoromethane

Column	Rtx®-624, 60 m, 0.25 mm ID, 1.40 µm (cat.# 10969)	**Detector**	Agilent 5973 GC-MS
Sample	502.2 Calibration Mix #1 (gases) (cat.# 30042)	Transfer Line Temp.:	280 °C
Injection	purge and trap split	Analyzer Type:	Quadrupole
Inj. Temp.:	300 °C	Tune Type:	BFB
Oven		Ionization Mode:	EI
Oven Temp:	60 °C	Scan Range:	35-550 amu
Carrier Gas	He, constant flow	**Instrument**	Agilent/HP6890 GC
Flow Rate:	1.0 mL/min.		

restek innovation!

Kit installs easily, without special tools or plumbing.



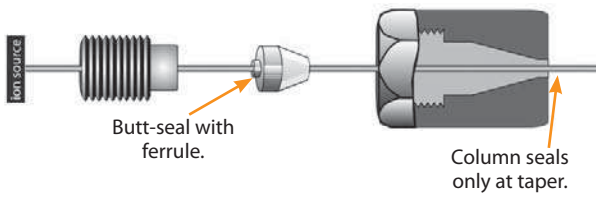
Description	qty.	cat.#
EZ No-Vent Connector Kit includes: EZ No-Vent Connector, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft.), column plug, column nut	kit	21323
Replacement ferrules for connecting capillary column to EZ No-Vent Connector:		
0.4 mm (Polyimide)	2-pk.	21015
0.5 mm (Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft.	21018
Replacement EZ No-Vent Column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110

MSD Conversion Fitting

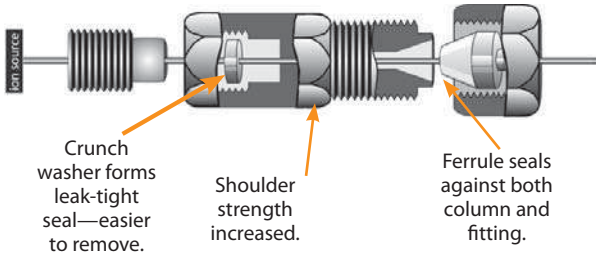

21314

- A flat, soft aluminum sealing ring deforms and butt-seals against the MSD interface.
- A standard Vespel® ferrule seals the column and 1/16-inch stainless steel nut.
- Fitting is constructed of nickel-plated brass for longevity and softness.
- Use any standard Vespel® or Vespel®/graphite 1/16-inch ferrule.
- Includes a 1/16-inch stainless steel nut and two replacement sealing rings. Order ferrules separately.
- Improved design reduces chance of leaks.

Agilent Design



Improved Restek Design



Description	qty.	cat.#
MSD Conversion Fitting	ea.	21314
Replacement Ring Seal for MSD Conversion Fitting	2-pk.	21313

MSD Source Nut


20643

- 1.2 mm nut bore permits easy removal of ferrules with a standard tapered-needle file (cat.# 20106).
- Made of brass to prevent thread-stripping on the transfer line.
- Design enhances ease of threading onto the transfer line and improves overall lifetime.

Description	Similar to Agilent part #	qty.	cat.#
(Detector) MSD Source Nut	05988-20066	2-pk.	20643

restek innovation!


21894

Capillary Installation Gauge for Agilent 5973/5975 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.


Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end. Tighten the nut (not depicted).


Score and remove the exposed end of the column.


Loosen the nut.

Description	Similar to Agilent part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894

Gold Tip Transfer Line


24699

- For use with Agilent 5971/5972 MS systems.
- Gold-plated for inertness.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Gold Tip Transfer Line	05971-20305	ea.	24699

Ion Source Cleaning Powder

Use this aluminum oxide powder to clean surfaces that contact the sample or ion beam when you encounter poor sensitivity and inadequate abundances at high masses.


22685

Description	Similar to Agilent part #	qty.	cat.#
Ion Source Cleaning Powder	8660-0791	1 kg	22685

Inland 45 is the highest-quality rough pump oil you can use for your mass spectrometer.

Inland 45 Pump Oil

Recommended for most mass spectrometers.

24819

- Ease at cold start.
- Low vapor pressure 10^{-7} torr.
- Nontoxic and noncorrosive.
- Compatible with buna-N, neoprene, and Viton® seals.
- Optimum vacuum pump performance.
- Lowest mass spectrometer background.
- Recommended for optimum mass spec performance.

Description	Similar to Agilent part #	qty.	cat.#
Inland 45 Pump Oil	6040-0834	1 liter	24819

Rough Pump Oil #19 for MSD Pumps, Oil Vacuum Pump

22687

- Formulated from crude oil stocks known for their durability and line-lubricating qualities.
- Use in Agilent 5973/5972/5971 and GCD mass spec systems, or in other manufacturers' MSD systems that require rough pump oil.
- Under average use, the oil in the foreline rough pump should be replaced every six months.

Description	qty.	cat.#
Rough Pump Oil for MSD Pumps	1 liter	22687

27194

GC-MS Cleaning Kit

Poor sensitivity, loss of sensitivity at high masses, or high multiplier gain during an auto tune are all indicators that your mass spectrometer source may need to be cleaned. Restek has assembled all of the necessary components for cleaning and polishing your ion source.

The Restek GC-MS Cleaning Kit (cat.#s 27194, 27195) includes:

- lint-free nylon gloves (small-2 pair)
- lint-free nylon gloves (large-2 pair)
- lint-free cotton cloth, 9 x 9 (10-pk.)
- micro mesh 4 x 6 sheet (4-pk.)
- aluminum oxide (1-kg jar)
- cotton tip applicators
- tweezers, large
- tweezers, small
- septum puller
- Dremel® tool, battery-operated (optional, 27194)
- tool kit bag

Reorder Kit (cat.# 27196) includes:

- lint-free nylon gloves (small-2 pair)
- lint-free nylon gloves (large-2 pair)
- lint-free cotton cloth, 9 x 9 (10-pk.)
- micro mesh 4 x 6 sheet (4-pk.)

Description	qty.	cat.#
Mass Spec Cleaning Kit with Dremel Tool	kit	27194
Mass Spec Cleaning Kit without Dremel Tool	kit	27195
Mass Spec Cleaning Kit Replacement Parts Kit Includes: cloths, micro mesh sheets, small and large gloves	kit	27196

ETP Electron Multipliers

for Mass Spectrometry


23074

- Air stable.
- 2-year shelf life guarantee.
- Discrete dynode design extends operating life.

The multi-dynode approach of all ETP multipliers results in longer lifetimes and better sensitivities compared with channel multipliers because of greater surface area.

The electron multipliers manufactured by ETP use a proprietary dynode material. This material has a number of properties that make it very suitable for use in an electron multiplier. It has very high secondary electron emission, which allows exceptional gain to be achieved from each dynode. This material is also very stable in air. In fact, an ETP multiplier can be stored for years before being used. As a direct result of the high stability of the active materials used in ETP multipliers, they come with a 2-year shelf life warranty (stored in original sealed package). Many testing laboratories take advantage of this long shelf life by keeping a replacement ETP multiplier on hand, ready for immediate installation. This keeps instrument downtime to a minimum.

did you know?

A typical ETP electron multiplier has a total active dynode surface area of ~1,000 mm^2 compared to a standard continuous dynode multiplier that only has a total channel surface area of around 106 mm^2. The increased surface area of the ETP slows the aging process and improves operating life.

Description	qty.	cat.#
Electron Multipliers for Agilent GC-MS and LC-MS		
For Agilent 5970 GC-MS	ea.	23072
For Agilent 5971, 5972, GC GC-MS	ea.	23073
For Agilent 5973 & 5975 GC-MS (includes mount for initial installation)*†	ea.	23074
For Agilent 5973 & 5975 GC-MS and LC-MSD (Replacement Multiplier)*†	ea.	23075

*Note: The electron multipliers have been specifically developed to retrofit the original manufacturer's equipment. The detector incorporates a modular design to facilitate ease of replacement and additional innovations intended to enhance performance. First-time installation requires a mount that includes the mechanical housing. After initial installation, only the replacement electron multiplier is required.
†This unit is designed for use in the 5975, 5973 GC, and the LC-MSD (not for 5975C Triple Axis Detector).

Other ETP Electron Multipliers are available upon request. Call us or contact your Restek representative if you do not see your instrument listed.

Supplies for Agilent GCs: Detector

Heater Cartridge & Platinum Resistance Thermometer (PRT) Sensor for Agilent 5890 GCs

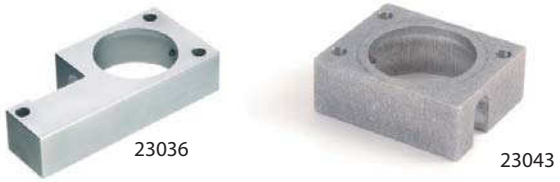
- Use with 5890 FID and split/splitless weldments.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Injector/FID Heater and Injector/FID PRT Sensor	05890-61140	kit	22068
Injector/FID Heater	19231-60620	ea.	22069
Injector/FID PRT Sensor	19231-60660	ea.	23035

FID Collector Housing Kits for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent part #	qty.	cat.#
FID Collector Housing Kit for Agilent 5890 GCs (includes collector body, spanner nut, and silicone washer—order mount separately)	19231-20920	kit	23037
FID Collector Housing Kit for Agilent 6890/7890 GCs (includes collector body, silicone washer, nut, and mount)	G1531-20550	kit	23045
FID Collector Housing for Agilent 6890/7890 GCs	G1531-20740	ea.	23044
Replacement Silicone Washers for FID Collector Housing for Agilent 5890/6890/7890 GCs	5180-4165	12-pk.	23064



FID Collector Mount for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Available for Agilent 5890, 6890, or 7890 GCs.

Description	Similar to Agilent part #	qty.	cat.#
FID Collector Mount for Agilent 5890 GCs	19231-20930	ea.	23036
FID Collector Mount for Agilent 6890/7890 GCs	G1531-20550	ea.	23043

FID Base Weldment for Agilent GCs

- Meets or exceeds original manufacturer's performance.
- Includes brass nut.
- Available for Agilent 5890, 6850, or 6890 GCs.

Description	Similar to Agilent part #	qty.	cat.#
FID Base Weldment for Agilent 5890 GCs	19231-80580	ea.	23041
FID Base Weldment, Pack Column FID for Agilent 6850/6890 GCs	G1531-80580	ea.	23052
FID Base Weldment, Capillary Column FID for Agilent 6850/6890 GCs	G1531-80630	ea.	23053

Note: 6890 GC connections to EPC modules are not compatible with the 7890 EPC modules.

Spanner Wrench for Agilent 5890/6890/6850/7890 FID Collector Assemblies

- Easily remove the nut from the FID collector without damaging the nut.
- Unique, ergonomic handle—easy to grip.
- Fits all instrument models.

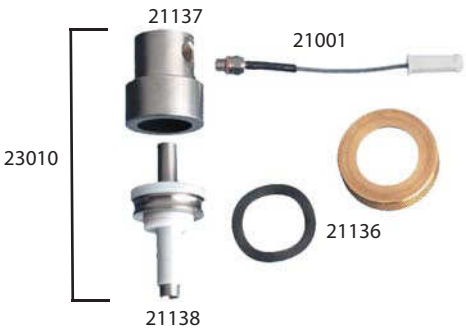
Remove FID ignitor castle.

Easily loosen the nut by aligning the two pins on the bottom of the wrench with the two open slots on the nut...

...then turn counterclockwise...

...and remove.

Description	Similar to Agilent part #	qty.	cat.#
Spanner Wrench for Agilent 5890/6890/6850/7890 FID Collector Assembly	19231-00130	ea.	22329



FID Collector Assembly Kit for Agilent 5890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent part #	qty.	cat.#
FID Collector Assembly Kit (includes insulators)	19231-60690	kit	23010
FID Collector Assembly Kit w/Siltek Ignitor Castle		kit	21131
FID Collector (includes insulators)	19231-20970, 19231-20960, 19231-20950	ea.	21138
FID Collector Nut and Washer	19231-20940, 5181-3311	set	21136
FID Ignitor*	19231-60680	ea.	21001
FID Ignitor Castle	19231-20910	ea.	21137
Siltek FID Ignitor Castle		ea.	21135

*Also fits OI Analytical 4410 detector (similar to OI part # 191833).

21000

FID Flow Measuring Adaptor
for Agilent 5890/6890/6850/7890 GCs

- Makes setting flows easy.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
FID Flow Measuring Adaptor	19301-60660	ea.	21000

FID Gauge Pack for Agilent 5890 GCs

- Pressure regulators and gauges for air and hydrogen.
- 1/8-inch bulkhead allows easy hookup to instrument.
- Rated for inlet pressures to 250 psi (1,724 kPa).
- Rated for outlet pressures of 0 to 60 psi (0–414 kPa).

22071

Description	qty.	cat.#
FID Gauge Pack for Agilent 5890 GCs	ea.	22071

FID Collector Assembly Kit for Agilent 6890/6850/7890 GCs

- Constructed of high-quality stainless steel.
- Meets or exceeds original manufacturer's performance.
- Individual replacement parts available.

Description	Similar to Agilent part #	qty.	cat.#
FID Collector Assembly Kit (includes insulator)	G1531-60690	kit	21699
FID Collector Assembly Kit w/Siltek Ignitor Castle		kit	21132
FID Collector (includes insulators)	G1531-20690, G1531-20700	ea.	21139
FID Collector Nut and Washer	19231-20940, 5181-3311	set	21136
FID Ignitor*	19231-60680	ea.	21001
FID Ignitor Castle	19231-20910	ea.	21137

*Also fits OI Analytical 4410 detector (similar to OI part # 191833).

FID Maintenance Kits for Agilent GCs

- Include the most common consumable GC supplies and tools.
- All parts meet or exceed performance of instrument manufacturer's parts.
- Parts list makes reordering easy.

FID kits include:

- 1/4" and 0.4, 0.5, and 0.8 mm ID graphite ferrules
- FID/NPD capillary adaptor
- Capillary nuts
- Jet reamers/ferrule removers
- 1/4" nut
- Scoring wafer
- Capillary column caps
- Ignitor for either Agilent 5890 or 6890/6850/7890 GCs
- FID flow-measuring adaptor
- 1/4" x 5/16" wrench
- Installation gauge
- Wire cleaning brush
- High-performance Siltek® treated FID jet for either Agilent 5890 (adaptable jet) or 6890/6850/7890 (dedicated jet) GCs
- Spanner wrench
- FID jet removal tool

22179

Description	qty.	cat.#
FID Maintenance Kit for Agilent 5890 GCs	kit	22180
FID Maintenance Kit for Agilent 6850/6890/7890 GCs	kit	22179

tech tip

Which FID Jet Should I Use?
There are two FID jet configurations for Agilent GCs. The longer "adaptable" jet fits both 5890 and 6890 GCs, and can be used with capillary or packed columns. The shorter "dedicated" jet is for the FID in the 6890/7890 GC that is designed only for use with capillary columns.

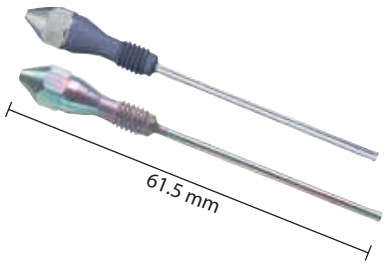
FID Replacement Jets

Standard Version

- Threads specially coated for easy installation and removal.
- Special processing ensures the highest degree of cleanliness.
- Meets or exceeds original manufacturer's performance.

High-Performance Version—Siltek® Treated

- Similar to the standard version, but Siltek® treated.
- Extremely inert, for use with active compounds.



Capillary Adaptable FID Replacement Jet for Agilent 5890/6890/6850 GCs

Engineered with a fluted tip to guide the capillary column into the jet.

Description	Similar to Agilent part #	qty.	cat.#	qty.	cat.#
Standard, 0.011-Inch ID Tip	19244-80560	ea.	20670	3-pk.	20671
High-Performance Siltek Treated, 0.011-Inch ID Tip	19244-80560	ea.	20672	3-pk.	20673

Capillary Dedicated FID Replacement Jet for Agilent 6890/6850/7890 GCs

Description	Similar to Agilent part #	qty.	cat.#	qty.	cat.#
Standard, 0.011-Inch ID Tip	G1531-80560	ea.	21621	3-pk.	21682
High-Performance Siltek Treated, 0.011-Inch ID Tip	G1531-80560	ea.	21620	3-pk.	21683
High-Temperature, 0.018-Inch ID Tip	G1531-80620	ea.	23078	3-pk.	23079

Packed Column FID Replacement Jets for Agilent 5890/6890/6850 GCs

- 0.018-inch ID jets: Used for most general-purpose packed column applications.
- 0.030-inch ID jets: For packings that exhibit high bleed and that frequently clog the tip of smaller 0.018-inch jets.

Description	Similar to Agilent part #	qty.	cat.#	qty.	cat.#
Standard, 0.018-Inch ID Tip	18710-20119	ea.	21694	3-pk.	21695
High-Performance Siltek Treated, 0.018-Inch ID Tip	18710-20119	ea.	21696	3-pk.	21697

Description	Similar to Agilent part #	qty.	cat.#	qty.	cat.#
Standard, 0.030-Inch ID Tip	18789-80070	ea.	21688	3-pk.	21689
High-Performance Siltek Treated, 0.030-Inch ID Tip	18789-80070	ea.	21686	3-pk.	21687

FID Jet Removal Tool for Agilent 5890/6890/6850/7890 FIDs

- Securely grips jet in socket for easy removal or installation.
- Unique, ergonomic handle—easy to hold.


22328


Slip tool over FID jet... ...loosen jet... ...and remove.

Description	qty.	cat.#
FID Jet Removal Tool for Agilent 5890/6890/6850/7890 FIDs	ea.	22328


23034

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.

FID/Injector Cleaning Kit

The FID/injector cleaning kit includes:

- Nylon tube brushes (1/8", 3/16", 1/4").
- Pipe cleaner.
- Stainless steel tube brushes (3/8", 3/16", 1/4").
- Stainless steel surface brush.
- Stainless steel jet reamers.
- Emery cloth.

Description	qty.	cat.#
FID/Injector Cleaning Kit	kit	20120

Injector/Detector Plug Nuts


21883

- Use to cap off an injector to isolate leaks.
- Use to cap off a detector for thermal cleaning.
- Use to check a detector or make-up gas flow rate.
- Use to cap off a detector and prevent hydrogen from accidentally diffusing into the oven from an unused detector base.

Description	Similar to Agilent part#	qty.	cat.#
Injector/Detector Plug Nuts	5020-8294	2-pk.	21883


20884

FID/NPD Adaptor Fitting

- Easy-to-use, sturdy, compact stainless steel fitting.
- 1/16-inch nut uses standard graphite or Vespel®/graphite ferrules.
- Wrench pad won't turn when installing a capillary column.
- Includes 1/4- and 1/16-inch stainless steel nuts, and 1/4-inch Vespel® and 0.4 mm ID graphite ferrules.

Description	qty.	cat.#
FID/NPD Adaptor Fitting	kit	20884

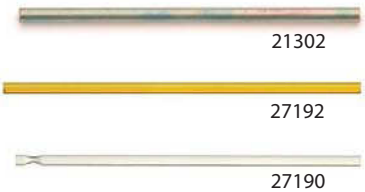

22077

FID/NPD Capillary Adaptor Fitting for Agilent 5890/6890/6850 GCs

- High-quality stainless steel construction.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
FID/NPD Capillary Adaptor Fitting	19244-80610	ea.	22077


21301



ECD/FID Dual-Purpose Make-Up Gas Kit

for Agilent 5890 GCs

Kit includes: replacement fitting, 1/4" nut, Vespel®/graphite ferrule, 1/16" nut, 0.4 mm ID graphite ferrule, Siltek®-treated guide.

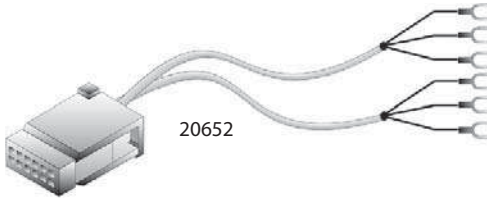
Description	Similar to Agilent part #	qty.	cat.#
ECD/FID Replacement Fitting Kit with Flow Manifold Connection		kit	21301
Replacement ECD Siltek Metal Guide		2-pk.	21302
Replacement ECD Fused Silica Liner	19233-20625	ea.	27192
		5-pk.	27193
Replacement Micro ECD Liner	G2397-20540	ea.	27190
		5-pk.	27191

Supplies for Agilent GCs: Cables & Autosampler

Replacement Cables

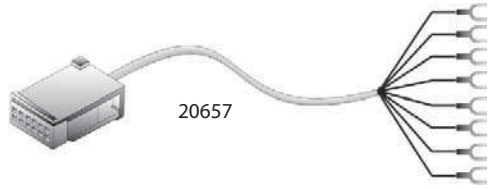
for Agilent GCs, Integrators, & Autosamplers

- Considerable savings over original manufacturer's equipment.
- Instructions and wiring diagrams included.
- Manufactured with only the highest-quality components.



Connect an Agilent 5890 GC to a non-Agilent integrator or standard strip chart recorder.

Description	Similar to Agilent part #	length	qty.	cat.#
Replacement Cable	05890-60800	6 ft	ea.	20652



Connect an Agilent 5890 GC to remote-start another piece of equipment or to start the Agilent 5890 GC from that piece of equipment.

Description	Similar to Agilent part #	length	qty.	cat.#
Replacement Cable	05890-61080	6 ft	ea.	20657

For quotes on custom cables, call 800-356-1688, ext. 4, or contact your Restek representative.

Injector Mounting Posts and Parking Post

for Agilent 7673 & 7683 Autosamplers

Performance equivalent to original manufacturer's parts.

Description	Similar to Agilent part #	qty.	cat.#
Injector Mounting Post for Agilent 7673 Series Autosamplers for use with 6890 GCs	07673-21140	ea.	21237
Injector Mounting Post for Agilent 7683 Series Autosamplers for use with 6850/6890 GCs	G2613-20500	ea.	21172
Parking Post for Agilent 7673/7683 Series Autosamplers for use with 5890/6890/7890 GCs	05890-61525	ea.	22343

Turret Tray Assembly

for Agilent 7673 Autosamplers

Holds sample, waste, and solvent vials.

Description	Similar to Agilent part #	qty.	cat.#
Turret Tray Assembly for Agilent 7673 Autosamplers	07673-60605	ea.	22855

Autosampler Plunger Carrier Belt

for Agilent 7673A & 7673B Autosamplers

All parts meet or exceed original manufacturer's performance.

Description	For Agilent Model #	Similar to Agilent part #	qty.	cat.#
Autosampler Plunger Carrier Belt	7673A, 7673B	07673-61275	ea.	22695

Carriage Motor Belt

for Agilent 7673A, 7673B, and 7673C Autosamplers

Meets original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Carriage Motor Belt for Agilent 7673A, 7673B, and 7673C	1500-0676	ea.	22692

Z-Belt for Agilent 7673B Autosamplers

Meets original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Z-Belt for Agilent 7673B Autosamplers	1500-0803	ea.	22363

Injector Turret Motor for Agilent 7673A & 7673B Injectors

Meets original manufacturer's performance.

Description	Similar to Agilent part #	qty.	cat.#
Injector Turret Motor for Agilent 7673A & 7673B Injectors	07673-60810	ea.	22337

22067

Viton® O-Rings for Apex Liners

Description	Max. temp.	qty.	cat.#
Viton O-Rings for APEX liners	250 °C	25-pk.	22067

22354

22355

Accessories for ATAS LINEX DMI System

Description	qty.	cat. #
Needle Guide for ATAS LINEX DMI Liner	5-pk.	22354
Microvial/Insert for ATAS LINEX DMI Liner	100-pk.	22355

Inlet Liner Seals
for Bruker/Varian 1177 Injectors

Meets or exceeds original manufacturer's performance.

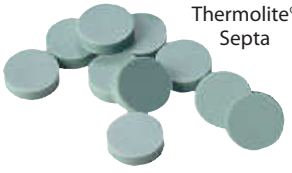
Description	Max. temp.	Similar to Bruker/Varian part #	10-pk. cat.#	50-pk. cat.#
6.35 mm ID Graphite O-Rings for split liners	450 °C	—	20296	20297
6.5 mm ID Graphite O-Rings for splitless liners	450 °C	39-26119-40	20298	20299

Liner Seals
for Bruker/Varian 1078/1079 GCs

Description	Max. temp.	Similar to Bruker/Varian part #	qty.	cat.#
5 mm Graphite Liner Seals for Bruker/Varian 1078/1079 GCs	450 °C	392611919, 392534201	10-pk.	22683

NEW!

Premium Non-Stick BTO® Septa



Thermolite® Septa

Septa for Bruker/Varian GCs

Septum Diameter	50-pk./price	100-pk./price
Thermolite Septa (usable to 340 °C inlet temp.)		
9 mm	27133	27134
9.5 mm (3/8")	27136	27137
10 mm	27139	27140
11 mm (7/16")	27142	27143
Premium Non-stick BTO Septa (usable to 400 °C inlet temp.*)		
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
10 mm	27088	27089
11 mm (7/16") CenterGuide	27090	27091

*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.
Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

HANDY septum size chart

Injector Type	Septum Diameter (mm)
Packed Column	9.5/10
1078/1079	10/11
1177	9
1075/1077	11

Merlin Microseal Septa
for Bruker/Varian GCs

400 °C max injection port temperature.

22779

22780

The advantages of the Merlin Microseal septum include elimination of septum coring, longer life, and consistently low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. Installation is simple, requiring no modification of the injection port.

Description	Merlin#	cat.#
General Purpose Kit for Bruker/Varian 1078/1079 GCs Includes: Nut, Adapter, O-Ring, & 1 General-Purpose (#410) Microseal	21-11W	22779
General Purpose Kit for Bruker/Varian 1177 GCs Includes Nut, Adapter, O-Ring, & 1 General-Purpose (#410) Microseal	22-11W	22780
Replacement Microseals		
General-Purpose Microseal (most applications, 3 to 100 psi)	410	22812
Low-Pressure Microseal (1 to 45 psi)	310	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W	22782


20881

Capillary Nuts for Bruker/Varian GCs

Choose brass or stainless steel construction.

Description	Similar to Bruker/Varian part #	qty.	cat.#
Brass Capillary Nuts	03-949551-00	2-pk.	20881
Stainless Steel Capillary Nuts	03-949551-00	2-pk.	20882

Siltek® Treated Inlet Support Springs

for Bruker/Varian 1075/1077 Split Injectors

Siltek® treated to eliminate sample adsorption.


21690

Description	Similar to Bruker/Varian part #	qty.	cat.#
Siltek Treated Inlet Support Springs for Bruker/Varian 1075/1077 Split Injectors	03-949786-00	3-pk.	21690


22335

Capillary Installation Gauge for Bruker/Varian GCs

for use with 1/16" ferrules

- Seats ferrule* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Bruker/Varian GCs for use with 1/16" ferrules	ea.	22335

*For use with graphite ferrules only.


22184

Everything you need in one complete kit!

Make Life Easier (MLE) Capillary Tool Kit

for Bruker/Varian GCs

Includes:

- Capillary installation gauge for Bruker/Varian GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22184

Rethreading Tool

for Bruker/Varian Injection Ports

- Repair worn or damaged threads.
- Multiple uses (injection ports, fittings, etc.).
- Built-in guide to prevent cross-threading.


23018

Make your injection port threads like new!

Screw the tool completely onto the injection port in a clockwise direction. Unscrew the tool and inspect the threads, repeat as necessary. When done, wipe threads with methanol to remove any debris.

Description	qty.	cat.#
Rethreading Tool for 7/16" compression fitting (Bruker/Varian injection ports)	ea.	23019
Rethreading Tool for 1/4" Bruker/Varian-style capillary column fittings	ea.	21893

restek innovation!

Kit installs easily, without special tools or plumbing.

EZ No-Vent® GC Column-Mass Spectrometer Connector

for Bruker/Varian Saturn 2000 Series Mass Spectrometers

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers' vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of downtime with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.

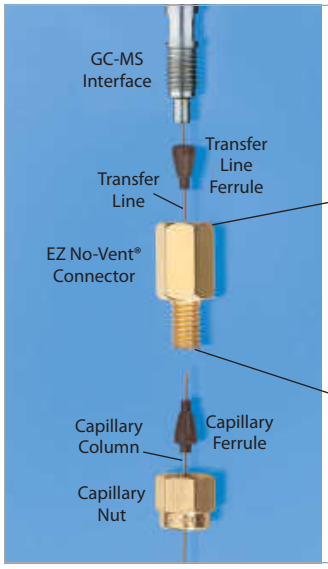
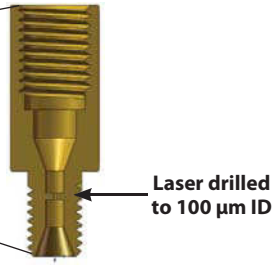


Figure 1: The EZ No-Vent® connector incorporates a laser- machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.



Change columns in minutes—without venting!

Description	qty.	cat.#
EZ No-Vent Connector Kit for Bruker/Varian Saturn 2000 Series MSs Includes: EZ No-Vent connector, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft), column plug, column nut	kit	22423
Replacement ferrules for connecting capillary column to EZ No-Vent connector:		
0.4 mm (Polyimide)	2-pk.	21015
0.5 mm (Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft.	21018
Replacement EZ No-Vent column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110

Graphite O-Rings for PerkinElmer Auto SYS XL or Clarus GCs With PSS Injector

Fits 4 mm OD liners.

Description	Max. temp.	Similar to PE part #	qty.	cat.#
Graphite O-Rings for PerkinElmer Auto SYS XL or Clarus GCs w/PSS Injector	450 °C	N610-1751	10-pk.	21475
	450 °C	N610-1751	25-pk.	21476

Viton® O-Rings for PerkinElmer PSS Injector

Fits 4 mm OD liners.

Description	Max. temp.	Similar to PE part #	qty.	cat.#
Viton O-Rings for PerkinElmer PSS Injector	250 °C	N6101747	10-pk.	20366

Silicone O-Rings for PerkinElmer Auto SYS XL or Clarus With CAP Injector

Fits 6.2 mm OD liners.

Description	Max. temp.	Similar to PE part #	qty.	cat.#
Silicone O-Rings for PerkinElmer Auto SYS XL or Clarus w/CAP Injector	250 °C	N6101374	10-pk.	20262

Thermolite® Septa

Premium Non-Stick BTO® Septa

Septa (11 mm) for PerkinElmer GCs

Thermolite Septa usable to 340 °C inlet temp.		Premium Non-Stick BTO Septa usable to 400 °C inlet temp.*	
qty.	cat.#	qty.	cat.#
50-pk.	27142	50-pk.	27090
100-pk.	27143	100-pk.	27091

*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

Merlin Microseal Septa for PerkinElmer GCs

22781

400 °C max injection port temperature.

The advantages of the Merlin Microseal septum include elimination of septum coring, longer life, and consistent low needle insertion force. The Microseal septum incorporates two separate sealing mechanisms. These sliding seals eliminate septum coring and the resulting accumulation of septum crumbs in the injection port liner.

The Microseal septum uses a 23-gauge (0.63 mm, 0.025") needle or probe with a blunt, truncated conical tip. Since the syringe plunger end details are determined by manual or autosampler compatibility, often a removable needle syringe is an effective way to match both of these requirements. Installation is simple, requiring no modification of the injection port.

Description	Merlin#	Similar to PE#	cat.#
General Purpose Kit for PerkinElmer GCs (3 to 100 psi) Includes: Nut, Adapter, O-ring & 2 General Purpose (#410) Microseals	51-12W	N9303344	22781
Replacement Microseals			
General-Purpose Microseal (most applications, 3 to 100 psi)	410	N9303345	22812
Low-Pressure Microseal (1 to 45 psi)	310		22815
Microseal for SPME Applications (3 to 100 psi)	21-01W		22782

22318 22319 22320

Injector Adaptors for PerkinElmer CAP Injector

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.
- Siltek®-treated version available for increased inertness.

Description	Similar to PE part #	qty.	cat.#
For use with PE-style capillary nuts			
Injector Adaptor for PerkinElmer CAP Injector	N6100157	ea.	22318
Siltek-Treated Injector Adaptor for PerkinElmer CAP Injector	—	ea.	22320
For use with 1/16" compression-style nuts			
Injector Adaptor for PerkinElmer CAP Injector	—	ea.	22319

FID Capillary Column Adaptors

for PerkinElmer Auto SYS XL

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.

22608

22609

Description	Similar to PE part #	qty.	cat.#
For use with PE-style capillary nuts			
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL	N6120020	ea.	22608
For use with 1/16" compression-style nuts			
FID Capillary Column Adaptor for PerkinElmer Auto SYS XL		ea.	22609

23038

FID Replacement Parts

for PerkinElmer Auto SYS XL and Clarus 500

- Made of high-quality stainless steel.
- Meet or exceed original manufacturer's performance.

Description	Similar to PE part #	qty.	cat.#
FID Jet for PerkinElmer Auto SYS XL and Clarus 500	N6100361	ea.	23038
Auto-Ignite FID Replacement Part Kit for PerkinElmer Auto SYS XL and Clarus 500	N6103167, N6103175, N6101085, N6001204, 09912223	kit	23061
Nozzle Insulator for PerkinElmer Auto SYS XL and Clarus 500	N6101085	ea.	23062
FID Body for PerkinElmer Auto SYS XL and Clarus 500	N6100364	ea.	23063

22185

Everything you need in one complete kit!

Make Life Easier (MLE) Capillary Tool Kit

for PerkinElmer GCs

Includes:

- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High temperature string (1 meter)
- Pipe cleaner (12-inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22185

Viton® O-Rings
for Shimadzu 17A, 2010, and 2014 GCs

Description	Max. temp.	Similar to Shimadzu part #	qty.	cat.#
Viton O-Rings for Shimadzu 17A, 2010, and 2014 GCs	250 °C	036-11203-84	10-pk.	24899

Graphite O-Rings
for Shimadzu 2010 and 2014 GCs

Description	Max. temp.	Similar to Shimadzu part #	qty.	cat.#
Graphite O-Rings for Split Liners	450 °C	221-48393-91	5-pk.	20243
Graphite O-Rings for Splitless Liners	450 °C	221-47222-91	5-pk.	20244

Thermolite® Septa

Premium Non-Stick BTO® Septa

NEW!

Septa (Plug) for Shimadzu GCs

Thermolite Septa usable to 340 °C inlet temp.		Premium Non-stick BTO Septa usable to 400 °C inlet temp.*	
qty.	cat.#	qty.	cat.#
50-pk.	27154	50-pk.	27098
100-pk.	27155	100-pk.	27099

*Minimum recommended operating temperature for premium non-stick BTO septa is 250 °C.

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer.

Septum Nut
for Shimadzu 17A, 2010, and 2014 GCs

- One-piece design for ease of installation and removal.
- Made of clear anodized aluminum and high-quality stainless steel.

22079

Description	Similar to Shimadzu part #	qty.	cat.#
Septum Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41286-00, 221-44584-00	ea.	22079

21895

Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs

Includes 17A injector nut, 0.4 mm graphite ferrule, and 1/16-inch stainless steel capillary nut.

Description	qty.	cat.#
Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	21895
Siltek Treated Injector Nut Kit for Shimadzu 17A, 2010, and 2014 GCs	kit	22331

Merlin Microseal Septa for Shimadzu GCs

- Compatible with Shimadzu models GC-2010 and GC-2025 only.
- 450 °C maximum injection port temperature.
- For use with 23-gauge (0.63 mm, 0.025") needle or probe with blunt, truncated conical tip.

22972

A Merlin Microseal septum provides several distinct advantages: elimination of septum coring, long lifetime, and consistently low needle-insertion force. The Microseal septum incorporates two separate sealing mechanisms; these sliding seals prevent septum coring and the associated accumulation of septum crumbs in the injection port liner. Installation is simple, requiring no modification of the injection port.

Description	Merlin #	cat.#
General Purpose Kit for Shimadzu GCs (3 to 100 psi) Includes: Nut, Adapter, O-Ring, & 2 General-Purpose (#410) Microseals	61-12	22972
Replacement Microseals		
General-Purpose Microseal (most applications, 3 to 100 psi)	410	22812
Low-Pressure Microseal (1 to 45 psi)	310	22815
Microseal for SPME Applications (3 to 100 psi)	21-01W	22782

22688

Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs

Meets original manufacturer's performance.

Description	Similar to Shimadzu part #	qty.	cat.#
Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	22688

20375

Restek Enhanced Capillary Nut
for Shimadzu 17A, 2010, and 2014 GCs

- Restek's design eliminates the slot, increasing lifetime and durability.
- Meets or exceeds original manufacturer's performance.

Description	Similar to Shimadzu part #	qty.	cat.#
Restek Enhanced Capillary Nut for Shimadzu 17A, 2010, and 2014 GCs	221-41533-00	2-pk.	20375

Supplies for Shimadzu GCs


21121

5 mm Ferrules for Shimadzu 17A GCs

- For use with packed columns.
- Graphite construction.

Description	qty.	cat.#
5 mm Ferrules for Shimadzu 17A GCs	10-pk.	21121


24829

Graphite Ferrules
for Shimadzu 17A, 2010, and 2014 GCs

- Graphite two-piece construction.
- Available in 0.4, 0.5, and 0.8 mm sizes.
- Packaged on mandrel for easy handling.

Ferrule ID	Fits Column ID	Similar to Shimadzu part #	qty.	cat.#
0.4 mm	0.25 mm and less	220-90765-00	10-pk.	24827
0.5 mm	0.32 mm	221-32126-05	10-pk.	24828
0.8 mm	0.53 mm	221-32126-08	10-pk.	24829


21159

Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu part #	qty.	cat.#
Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159


22333

Capillary Installation Gauge
for Shimadzu 17A, 2010, and 2014 GCs

- Seats ferrule* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Description	qty.	cat.#
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333

*For use with graphite ferrules only.


22334

Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#
1/4" x 5/16" and 10 mm x 11 mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334

22630 22631 22632

FID Jets for Shimadzu 2010 GCs

Description	Similar to Shimadzu part #	qty.	cat.#
Capillary FID Jet for Shimadzu 2010 GCs	221-48258-91	ea.	22630
Packed Column FID Jet for Shimadzu 2010 GCs	221-48885-91	ea.	22631
Wide Bore FID Jet for Shimadzu 2010 GCs	221-49373-91	ea.	22632

Everything you need in one complete kit!


22182

Make Life Easier (MLE) Capillary Tool Kit
for Shimadzu GCs

Includes:

- Capillary installation gauge for Shimadzu GCs
- Injector wrench for Shimadzu GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182

Replacement Inlet Seals With Washers

- Siltek® treatment provides inertness similar to fused silica.
- All seals include washers.

Replacement Inlet Seals for Thermo Scientific 1300/1310 GCs

The inlet seal at the base of the GC injection port contacts the sample and must be changed frequently to prevent adsorption of active compounds. In addition, septum fragments and sample residue accumulate on the disk surface, requiring disk replacement.

22231

NEW!

22237

Note: The 1.2 mm inlet seal is recommended when installing two columns using a two-hole Vespel®/graphite ferrule.

Single-Column Installation 0.8 mm ID (Opening)	Similar to Thermo part #	qty.	cat.#
Gold-Plated	290GA082	2-pk.	22231
Gold-Plated	290GA081	10-pk.	22232
Siltek-Treated	290GA092	2-pk.	22237
Siltek-Treated	290GA091	10-pk.	22238
0.25/0.32 mm ID Dual-Column Installation **1.2 mm ID (Opening)**	**Similar to Thermo part #**	**qty.**	**cat.#**
Gold-Plated	290GA122	2-pk.	22233
Gold-Plated	290GA121	10-pk.	22234

Cross-Disk Inlet Seals for Thermo Scientific 1300/1310 GCs

All seals include washers.

NEW!

22235

22239

0.8 mm ID Cross-Disk Inlet Seal	Similar to Thermo part #	qty.	cat.#
Gold-Plated	290GA083	2-pk.	22235
Gold-Plated	290GA084	10-pk.	22236
Siltek-Treated	290GA093	2-pk.	22239
Siltek-Treated	290GA094	10-pk.	22240

Supplies for Thermo Scientific GCs

Inlet Liner Seals
for Thermo Scientific TRACE PTV

Description	Max. temp.	Similar to TS part #	qty.	cat.#
Inlet Liner Seals for Thermo Scientific TRACE PTV	450 °C	29013417	2-pk.	21392

Graphite Sealing Ring for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL Instruments

Description	Max. temp.	Similar to TS part #	qty.	cat.#
Graphite Sealing Ring for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	450 °C	290-334-06	ea.	21898
	450 °C	290-334-06	2-pk.	21899

Premium Non-Stick BTO® Septa

Septa (9 mm, 9.5 mm, 11 mm, 17 mm) for Thermo Scientific GCs
Premium Non-Stick BTO® Septa

- Usable to 400 °C inlet temperature*.
- New plasma coating eliminates sticking in the injection port.
- Precision molding ensures consistent, accurate fit.
- Partial predrilled CenterGuide design.
- Preconditioned and ready to use.
- Packaged in ultra-clean blister packs**.
- Each batch GC-FID tested.
- Bleed and temperature optimized; ideal for demanding GC and GC-MS applications.

Septum Diameter	50-pk.	100-pk.
Premium Non-Stick BTO Septa (usable to 400 °C inlet temp.*)		
9 mm CenterGuide	27084	27085
9.5 mm (3/8")	27086	27087
11 mm (7/16") CenterGuide	27090	27091
17 mm CenterGuide	27096	27097

Note: Due to differences in inlet design, the actual septum temperature for a given inlet setpoint can vary by manufacturer. Restek recommends using only BTO® septa in Thermo Scientific instruments.
*For 17 mm injectors, the maximum temperature is 330 °C. For all injectors, minimum recommended operating temperature for BTO® septa is 250 °C.
**17 mm septa packaged in precleaned glass jars.

HANDY septum size chart

Instrument	Septum Diameter (mm)
Thermo Scientific	
TRACE GC, 8000, 8000 TOP, GCQ w/TRACE, PTV, 8000 series17	17
TRACE 1300, 1310	11
Finnigan (TMQ)	
GC 9001, GCQ, QCQ, TRACE 2000	9.5

Septum Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

24971

Description	Similar to TS part #	qty.	cat.#
Septum Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	35001050	ea.	24971

21299

24972

Septa Holder Kits
for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

- Includes septum support and holder.
- Made from high-quality stainless steel.
- Silcosteel®-AC-treated version helps with septum removal.

Description	Similar to TS part #	qty.	cat.#
Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	23303015, 350054335	kit	21299
Silcosteel-AC-Treated Septa Holder for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	23303015, 35005433	kit	24972

Gold-Plated Liner Cap
for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

22089

Description	Similar to TS part #	qty.	cat.#
Gold-Plated Liner Cap for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	29004290	ea.	22089

Silver Seals for Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

23057

Description	Similar to TS part #	qty.	cat.#
Silver Seal for Split/Splitless Injector	29033629	10-pk.	23057
	29033629	20-pk.	23058


24916


24969


24917


24970


20543


20544

Adapters for Capillary Columns
on Thermo Scientific TRACE & Focus SSL

- Use same installation distance as manufacturer's adaptors.
- Made of high-quality stainless steel.
- Siltek®-treated version available for additional inertness.

Description	Similar to TS part #	qty.	cat.#
For use with standard 1/16" ferrules.			
Adaptor for Capillary Column on Detector Base		ea.	24916
Adaptor for Capillary Column on Split/Splitless Injector		ea.	24917
Siltek Treated Adaptor for Capillary Column on Split/Splitless Injector		ea.	20543
For use with M4 ferrules.			
Adaptor for Capillary Column on Detector Base	347 25 436	2-pk.	24969
Adaptor for Capillary Column on Split/Splitless Injector	347 05 451	ea.	24970
Siltek Treated Adaptor for Capillary Column on Split/Splitless Injector		ea.	20544

Nut for Terminal Fitting
for Thermo Scientific TRACE GCs


24896

Description	Similar to TS part #	qty.	cat.#
Nut for Terminal Fitting for Thermo Scientific TRACE GCs	350 221 25	2-pk.	24896

Fixing Nut for Capillary Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL

Made of high-quality stainless steel.


24973

Description	Similar to TS part #	qty.	cat.#
Fixing Nut for Capillary Column for Split/Splitless Injector on Thermo Scientific TRACE, 8000, 8000 TOP & Focus SSL	350 32 423	5-pk.	24973

Graphite Ferrules (M4 Fittings)
for Thermo Scientific TRACE, 8000, 8000 TOP & Focus GCs

Ferrule ID	Fits Column ID	Similar to TS part #	Graphite 2-pk.	Graphite 10-pk.
0.3 mm	0.10–0.15 mm	—	22221	22222
0.4 mm	0.18–0.28 mm	29013488 (2-pk.) 29053488 (10-pk.)	20280	20281
0.5 mm	0.32 mm	29013487 (2-pk.) 29053487 (10-pk.)	20282	20283
0.8 mm	0.45–0.53 mm	29013486 (2-pk.) 29053486 (10-pk.)	20284	20285

FID Jet for Thermo Scientific TRACE & Focus GCs

Meets or exceeds original manufacturer's performance.


23080

Description	Similar to TS part #	qty.	cat.#
FID Jet for Thermo Scientific TRACE & Focus GCs	404 043 01	ea.	23080

How can we help you today? Contact us...

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Liner Cap Removing Tool

for Thermo Scientific GCs: Focus GC, TRACE GC Ultra & TRACE GC x GC

24937

- Easily loosens the liner cap from the injector.
- Unique, ergonomic handle—easy to grip.

Remove septum cap, septum holder, septum, and septum support.

Place tool on liner cap. Align two pins on bottom of tool with two open slots on liner cap.

Turn counter-clockwise to loosen liner cap.

Use tweezers (cat.# 20101) to remove liner cap.

Description	Similar to TS part #	qty.	cat.#
Liner Cap Removing Tool for Thermo Scientific GCs	205 070 10	ea.	24937

22997

Metric Wrench Set

High-quality 6 x 7 mm, 8 x 10 mm, and 16 x 17 mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#
Metric Wrench Set	set	22997

22999

Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999

22330

Capillary Installation Gauge

for Thermo Scientific TRACE & Focus SSL (M4 Ferrules)

- Seats ferrule* onto column for consistent installations.
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Install nut and ferrule onto column. Cut column end squarely. Slide column into installation gauge to recommended insertion distance. Finger-tighten column nut.

Tighten assembly to ensure a properly seated ferrule. Loosen assembly and remove column and column nut.

The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330

*For use with graphite ferrules only.

MLE Make Life Easier!

Everything you need in one complete kit!

22183

Make Life Easier (MLE) Capillary Tool Kit

for Thermo Scientific GCs

Includes:

- Capillary installation gauge for Thermo Scientific GCs
- Liner cap removing tool for Thermo Scientific GCs
- 1/8", 3/16", and 1/4" nylon brushes
- 1/4", 3/8", and 3/16" stainless steel wire tube brushes
- Stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench
- Rubber-tipped slide-lock tweezers
- Scoring wafers
- Inlet liner removal tool
- Septum puller
- Mini wool puller/inserter tool
- 4-inch tapered needle file
- Swivel head flashlight
- Mini hand drill set
- 15 cm compact steel ruler
- Pocket magnifier
- High-temperature string (1 meter)
- Pipe cleaner (12 inch)
- Cotton tip swabs (pk. of 25)

Description	qty.	cat.#
MLE Capillary Tool Kit	kit	22183

EZ No-Vent® GC Column-Mass Spectrometer Connector

for Thermo Scientific Focus DSQ GC Mass Spectrometers

22454

- Change GC-MS columns in minutes without venting—100 µm transfer line maintains vacuum and prevents venting.
- Easy to install and maintain—no special tools or plumbing required.
- Gold-plated body for inertness.
- High-temperature polyimide ferrules eliminate leaks at the problematic transfer line fitting.
- Lower cost than other "no-vent" fittings.

We designed the EZ No-Vent® GC column-mass spectrometer connector to be simple and easy to use. A critical orifice in the EZ No-Vent® connector minimizes the amount of oxygen allowed into the MS source, eliminating the need for purge gas as is required for other manufacturers' vent systems. This enables you to skip the lengthy vent and pump-down cycle otherwise required when you make a column change, saving nearly a day of downtime with each column change. The EZ No-Vent® connector easily attaches to the MS source without special tools or extra plumbing.

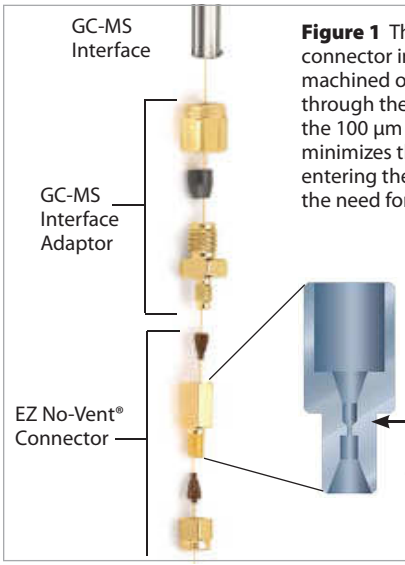


Figure 1 The EZ No-Vent® connector incorporates a laser machined orifice for optimal flow through the fitting. Coupled with the 100 µm ID transfer line, it minimizes the amount of oxygen entering the MS, which eliminates the need for purge gases.

Description	qty.	cat.#
EZ No-Vent Connector Kit for Thermo Scientific Focus DSQ GC Mass Spectrometers Includes: EZ No-Vent Connector, interface adaptor, two 0.4 mm ID adaptor ferrules for capillary column, two 0.4 mm ID ferrules for transfer line, 100 µm deactivated transfer line (3 ft), column plug, column nut	kit	22454
Replacement Ferrules for connecting capillary column to EZ No-Vent Connector:		
0.4 mm (Polyimide)	2-pk.	21015
0.5 mm (Polyimide)	2-pk.	21016
Replacement Ferrules (polyimide) for connecting transfer line to EZ No-Vent connector: 0.4 mm ID	2-pk.	21043
Replacement 100 µm Deactivated Transfer Line	3 ft	21018
Replacement EZ No-Vent Column Nut	20-pk.	23100
Replacement EZ No-Vent Plug	5-pk.	23112
Open-End Wrenches, 1/4" x 5/16"	2-pk.	20110
Open-End Wrenches, 3/8" x 7/16"	2-pk.	22455

22082

Transfer Line Reducing Kit

for Thermo Scientific TRACE & Focus DSQ Mass Spectrometers

Meets or exceeds original manufacturer's performance.

Description	Similar to TS part #	qty.	cat.#
Transfer Line Reducing Kit for Thermo Scientific TRACE & Focus DSQ Mass Spectrometers	76458-2014s, 76458-2009s, A0101-03151	kit	22082

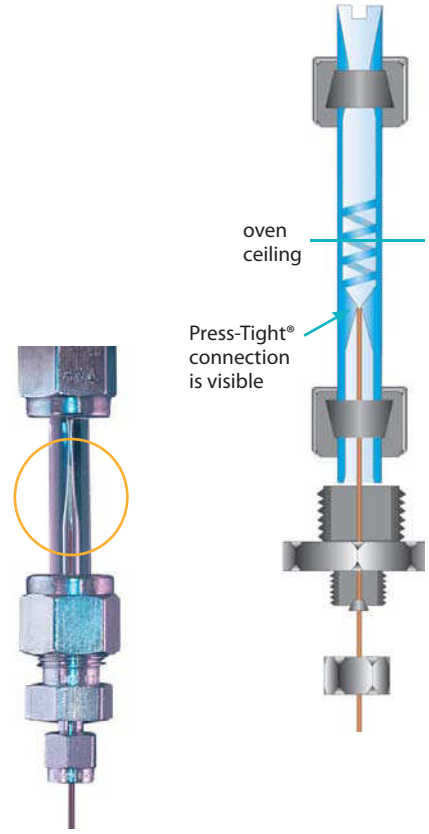
Packed Column Inlet Conversion

it's a fact

The 1/4-inch Vu-Tight liner fits directly into a 1/4-inch injection port. The connection between the liner and the column is in the GC oven, allowing visual confirmation of the seal. Problems, such as a crushed column end in the Press-Tight® taper, can be detected easily, making proper installation worry-free. The Cyclo Vu-Tight liner prevents nonvolatile residue from contaminating the column.

Converting Packed Inlets to Capillary Column Use

Two types of inlet conversion kits are available for a 1/4-inch packed column injection port to fit either 0.32 or 0.53 mm ID capillary columns: the Vu-Tight liner and the Uniliner® liner with adaptor (next page). The Vu-Tight liner fits directly into the 1/4-inch injection port and allows visual confirmation of the connection between the column and the liner. The Uniliner® liner and adaptor work together to allow either direct or on-column injection when using 0.53 mm ID columns. Both systems incorporate a Press-Tight® connection between the liner and column inlet, minimize dead volume, and reduce solvent peak tailing.



Features of Both Conversion Kits:

- Fit Agilent, Bruker/Varian, and other common GCs with 1/4-inch packed column injection ports (with maximum insertion depth of 4 inches).
- Install easily within fifteen minutes.
- Accommodate either 0.32 or 0.53 mm ID fused silica columns (tubing OD ≥ 0.5 mm).
- Liners are deactivated and extremely inert.
- Liners designed to accept dirty samples are available for either system.
- Press-Tight® connections between the liner and column inlet minimize dead volume, reduce solvent peak tailing, and sharpen early-eluting components.

Vu-Tight Inlet Liners for 1/4-Inch Packed Injection Port Conversion

- Visually observe the Press-Tight® connection between the column end and liner.
- Fit 0.32 and 0.53 mm ID capillary columns (column ODs from 0.5 mm to 0.8 mm).
- Slotted top prevents obstruction of carrier gas flow.
- Two designs available.
- Operate in the direct injection mode.

Vu-Tight DI Liners for 1/4-Inch Packed Injection Port Conversion

Can easily be packed with wool for dirty samples.

Description	qty.	cat.#
Vu-Tight DI Liner	ea.	20342
Vu-Tight DI Liner	5-pk.	20343
Vu-Tight DI Liner	25-pk.	20344

Cyclo Vu-Tight DI Liners (1/4-inch OD)

Ideal for dirty samples. Spiral bore prevents nonvolatile residue from contaminating the column.

Description	qty.	cat.#
Cyclo Vu-Tight DI Liner	ea.	20787
Cyclo Vu-Tight DI Liner	5-pk.	20788

Vu-Tight Installation Fittings Kit

Includes a 1/4-inch stainless steel nut and graphite ferrule for attaching the liner to the GC inlet and a 1/4 to 1/16-inch stainless steel reducer, plus a 1/4-inch and 0.5 mm ID graphite ferrule for attaching the column to the liner.

Description	qty.	cat.#
Vu-Tight Installation Fittings Kit	kit	20504

Uniliner® Liner for 1/4-Inch Packed Injection Port Conversion

- Reduces solvent tailing.
- Versatile—0.53 mm ID version can be used in the direct (DI) or on-column (OC) injection mode.
- Incorporates a gentle taper that seals the column and reduces dead volume in direct injection mode.
- Available in various designs.

On-column injections can be performed only with 0.53 mm ID columns because 26-gauge needles do not fit into the bore of 0.32 mm ID columns, or into the Unliner® liner taper.

Description	Column ID Injection Mode*	ea. cat.#	5-pk. cat.#
Uniliner Liner (small buffer volume chamber 60 mm long, for injections ≤2 µL) 	0.53 mm DI or OC	20902	20903
Uniliner Liner (large buffer volume chamber 85 mm long, for injections ≤4 µL) 	0.32 & 0.53 mm DI only	20308	20309
	0.53 mm DI or OC	20301	20305
Cyclo-Uniliner Liner (for active, dirty samples) 	0.32 & 0.53 mm DI only	20319	20320
Open-Top Uniliner Liner (packed with wool) 	0.32 & 0.53 mm DI only	20315	20316
Low Volume/Purge & Trap Uniliner Liner (1 mm ID x 5 mm OD: use in 1/4" injection ports to troubleshoot purge & trap units) 	0.32 & 0.53 mm DI only	20307	20314

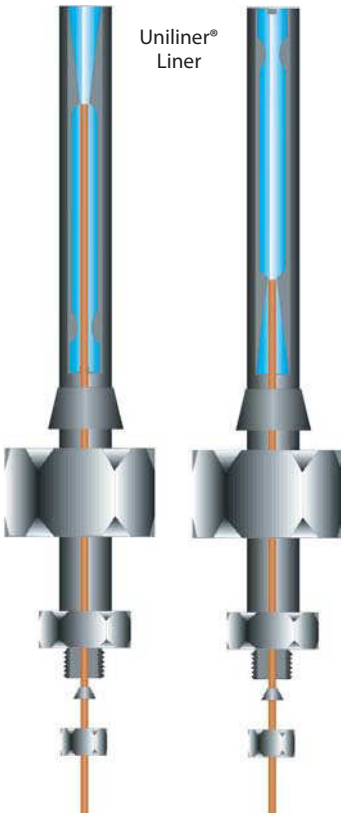
Uniliner Liner Adaptor (required for installing Uniliner liners in 1/4" injection ports) 	Includes 1/4-inch nut & graphite ferrule, 1/16-inch nut, and 0.8 mm ID graphite ferrule.		
		Stainless Steel	**Siltek-Treated**
	For injection ports <8 cm	20310	22282
	For injection ports 8-15 cm	20311	
1/4" Ferrules for Uniliner Liner Adaptor	cat.# 20234 (5-pk.)		

*DI = direct injection, OC = on-column injection

Note: a Uniliner liner must be used with a Uniliner liner adaptor (cat.# 20310 or 20311) for 1/4-inch injection ports. Remember to include a liner adaptor when ordering a Uniliner liner, unless you are purchasing replacement Uniliner liners.

it's a fact

5 mm Uniliner® liners fit into the 1/4-inch Uniliner® liner adaptor, which fits into a 1/4-inch injection port. The Uniliner® liner can be inserted in one direction for direct injections or inverted for on-column injections. Because the 1/4-inch injection port ferrule seals against the metal liner adaptor surface, it is virtually impossible to crack the glass Uniliner® liner during installation.



Packed Column Inlet Conversion, Dual-Column Analysis

Injection Port Conversion Chart

	Uniliner Liner Set-Up		Vu-Tight Fitting	
Instrument	**Uniliner Liner:** cat.# 20301, 20305, 20308, 20309, 20315, 20316, 20319, 20320, 20902, & 20903	**Liner Adaptor:** cat.# 20310	**Vu-Tight Fitting Kit:** cat.# 20504 **Liner:** cat.# 20342, 20343, 20344, 20787, & 20788	**Vu-Tight Fitting Kit:** cat.# 20504
Agilent GCs (1/4-inch injection ports) Models: 5700, 5710, 5711, 5712, 5830, 5840, 5880, 5890, 6850, 6890	✓	✓	✓	✓
Varian GCs (1/4-inch injection ports) Models: 1200, 1400, 2100, 2400, 3300-3700, 4400, 4600, 6000	✓	✓	✓	✓
Tracor GCs (1/4-inch injection ports) Models: 540, 550, 560, 565, 570	✓	✓	✓	✓
Packard Becker GCs (1/4-inch injection ports) Models: 427, 428, 429, 430, 433, 436, 437, 438	✓	✓	✓	✓
Gow-Mac GCs (1/4-inch injection ports) Models: 69-750, 69-550	✓	✓	✓	✓
HNU GCs (1/4-inch injection ports) Models: 301, 401, 421	✓	✓	✓	✓
PerkinElmer GCs (1/4-inch injection ports) Models: Sigma, 1B-4B, 300, 2001, 2100	✓	✓	✓	✓
PerkinElmer Auto SYS*	✓			

*Does not require Uniliner liner adaptor.

Inlet Adaptor Kit for Dual Column Installation

for Agilent Capillary Injectors (Split/splitless fitting for capillary columns)

27185

- 1/16-inch split/splitless fitting that accepts standard, two-hole capillary ferrules.
- Easier to install capillary columns due to the nut protruding farther from the insulated injection port chamber.
- Same column insertion depth as the original manufacturer's equipment.
- Kit includes adaptor fitting, 1/16" capillary nut, gold-plated 1.2 mm ID dual Vespel® ring inlet seal, one 0.4 mm ID two-hole ferrule, and one 0.5 mm ID two-hole ferrule.

Description	qty.	cat.#
Inlet Adaptor Kit for Dual Column Installation for Agilent Capillary Injectors	kit	27185
1.2 mm ID Dual Vespel Ring Inlet Seal, Gold-Plated	2-pk.	21246
	10-pk.	21247

20645

1/8-Inch Capillary Inlet Adaptor Fitting Kit

(Split/splitless fitting for 0.53 mm ID capillary columns)

- 1/8-inch split/splitless fitting accepts standard two-hole capillary ferrules and a standard 1/8-inch nut.
- Makes column installation easy due to the nut protruding farther from the insulated injection port chamber.
- The column insertion depth is the same as the original equipment.
- Kit includes adaptor fitting, capillary nut, stainless steel inlet seal, washer, and one 0.8 mm ID two-hole ferrule.
- Use recessed taper liners with this adaptor.

Description	qty.	cat.#
1/8-Inch Capillary Inlet Adaptor Fitting Kit	kit	20645
0.53 mm ID Dual-Column Installation	2-pk.	20392
1/16-inch ID (Opening) Replacement Inlet Seal	10-pk.	20393

Graphite Replacement Ferrules

ID	fitting size	qty.	cat.#
0.5 mm	1/16"	10-pk.	20201
	1/16"	50-pk.	20228
0.8 mm	1/16"	10-pk.	20202
	1/16"	50-pk.	20224
1/4-inch	1/4"	10-pk.	20210

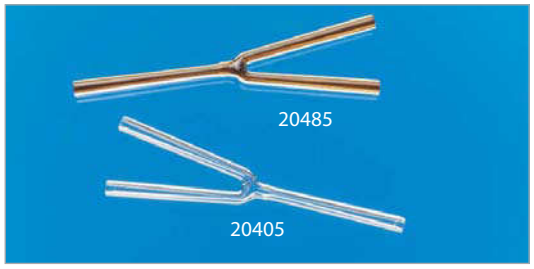
Two-Hole Ferrules for 1/8-Inch and 1/16-Inch Compression-Type Fittings

- Use 1/16-inch, two-hole ferrules with the 1/16-inch capillary inlet adaptor fitting kit (cat.# 27185).
- Use 1/8-inch, two-hole ferrules with the 1/8-inch capillary inlet adaptor fitting kit (cat.# 20645).

Fitting Size	Ferrule ID	Fits Column ID	qty.	Vespel/Graphite
1/16"	0.4 mm	0.25/0.28 mm	5-pk.	24848
1/16"	0.5 mm	0.32 mm	5-pk.	24849
1/8"	0.8 mm	0.45/0.53 mm	5-pk.	20246

Press-Tight® Connectors

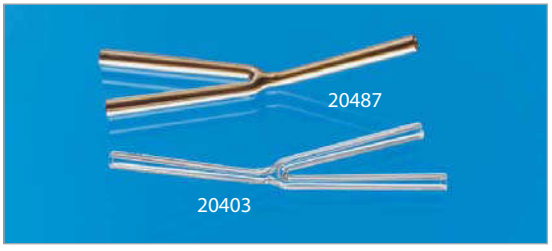
- Deactivated Press-Tight® connectors maintain complete inertness along the GC flow path.
- Siltek®-deactivated connectors are ideal for organochlorine pesticides analysis.
- Fit 0.33–0.74 mm OD columns (Restek 0.1–0.53 mm ID).



Universal "Y" Press-Tight® Connectors An alternative method of performing dual-column confirmational analyses!

- Split sample flow onto two columns—perform confirmation analysis with a single injection.
- Split a single column flow to two detectors.

Description	ea.	3-pk.
Universal "Y" Press-Tight Connector	20405	20406
Universal "Y" Press-Tight Connector, Deactivated	20405-261	20406-261
Universal "Y" Press-Tight Connector, Siltek Deactivated	20485	20486



Universal Angled "Y" Press-Tight® Connectors

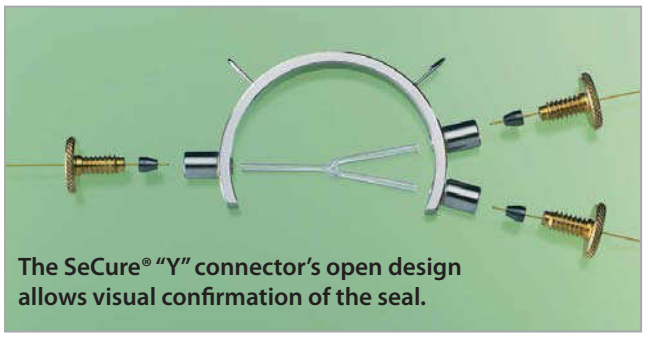
- Perform confirmation analysis with a single injection.
- Inlet and outlet ends conform to the column curvature—alleviates column-end connection strain.

Description	ea.	3-pk.
Universal Angled "Y" Press-Tight Connector	20403	20404
Universal Angled "Y" Press-Tight Connector, Deactivated	20403-261	20404-261
Universal Angled "Y" Press-Tight Connector, Siltek Deactivated	20487	20469

Polyimide Resin

Securely connects a Press-Tight® connector to a fused silica column.

Description	Max. Temp.	qty.	cat.#
Polyimide Resin	350 °C	5 grams	20445



The SeCure® "Y" connector's open design allows visual confirmation of the seal.

SeCure® "Y" Connector Kits

- Connect two analytical columns to a transfer line or guard column.
- Use standard "Y" Press-Tight® connectors and 1/16" graphite ferrules.
- Reliable seal integrity—will not unexpectedly disconnect during temperature-programmed analyses.
- Open design allows visual confirmation of the seal for added confidence in the connection.
- Fit both Restek cage designs.

Combine the simplicity of a "Y" Press-Tight® connector with the strength of a metal union. The ferrules and knurled nuts hold the fused silica tubing in place, which prevents the tubing from unexpectedly disconnecting, even at temperatures as high as 400 °C.

Kits include: SeCure® "Y" connector body, three knurled nuts, universal "Y" Press-Tight® union, three ferrules.

Description	Ferrules Fit Column ID	qty.	cat.#
SeCure "Y" Connector Kit	0.18/0.25/0.28 mm	kit	20276
SeCure "Y" Connector Kit	0.32 mm	kit	20277
SeCure "Y" Connector Kit	0.45/0.53 mm	kit	20278
Knurled Nut		3-pk.	20279

MXT® "Y"-Union Connector Kits

for Fused Silica Columns

- Low-dead-volume, leak-tight connection.
- Reusable.
- Siltek® treatment ensures maximum inertness.
- Ideal for connecting a guard column or transfer line to an analytical column.
- Use to oven temperatures of 360 °C.
- Available in union and "Y" configurations.
- Can also be used for connecting fused silica to metal.

Each kit contains the MXT® union; three 1/32-inch nuts; and three, one-piece, fused silica adaptors.

Description	qty.	cat.#
For 0.25 mm ID Fused Silica Columns	kit	21389
For 0.32 mm ID Fused Silica Columns	kit	21388
For 0.53 mm ID Fused Silica Columns	kit	21387

Replacement Accessories for Hall 1000

ELCD Nickel Reaction Tubes for Hall 1000

- Pretreated for maximum sensitivity.
- Quality-controlled for reliability.
- Available for many popular models.

To replace these instrument part numbers:		Order these Restek part numbers:	
ELCD Model #	**Instrument #**	**qty.**	**cat.#**
Hall 1000	PerkinElmer # N660-1072 Shimadzu # 220-90435-00 Tremetrics # 117459-0003 Varian # 00-997625-12	2-pk.	21581
O.I. 4420	O.I. Analytical # 260323	2-pk.	21582

ELCD Nickel Reaction Tube Nut

for Hall 1000

High-quality stainless steel ELCD nut mounts nickel reaction tube into ELCD.

Description	qty.	cat.#
ELCD Nickel Reaction Tube Nut	2-pk.	21584

1/16-Inch Vespel®/Graphite Sealing Ring

Replacement Accesories for Hall 1000

Installs onto the nickel reaction tube after the screw. Easily compresses on the reaction tube to provide a leak-tight seal and prevent detector oxidation.

Description	qty.	cat.#
1/16-Inch Sealing Ring, Vespel/Graphite	2-pk.	21583

Cleaned PTFE Transfer Lines for ELCDs

We stringently clean our ELCD PTFE transfer lines with an HCl solution to remove any contaminants, then rinse with methanol. Convenient 6.5-inch precut pieces directly interface the nickel reaction tube and conductivity cell in Tracor, Tremetrics, O.I., and many other ELCDs.

Description	qty.	cat.#
PTFE Transfer Lines for ELCDs, 1/16" OD x 0.020" ID (five 6.5-inch lines)	5-pk.	20121

Antifoam Agent for Purge & Trap Samples

- Efficiently controls foam; effective over a wide pH range.
- No hazardous materials, no components that are target analytes.
- Effective at less than 0.1% of sample volume.

See **page 510.**

Purge-and-Trap Spargers

- Available with uniform frits, to ensure maximum purging efficiency.
- Use nonfritted spargers for wastewater samples.
- Manufactured to tight tolerances to ensure a leak-tight seal.

Description	Volume	qty.	cat.#
Fritted Spargers			
Fritted, 1/2-inch mount	5 mL	ea.	21150
Fritted, 1/2-inch mount	10 mL	ea.	26138
Fritted, 1/2-inch mount	25 mL	ea.	21151
Non-Fritted Spargers			
Non-Fritted, 1/2-inch mount	5 mL	ea.	26139
Non-Fritted, 1/2-inch mount	10 mL	ea.	26140
Non-Fritted, 1/2-inch mount	25 mL	ea.	26141

21035

Moisture Control By-Pass Lines for Tekmar Instruments

- Increase response for ketones, alcohols, and acetates.
- Silcosteel®-deactivated tubing for increased inertness.
- Suitable for U.S. EPA Methods 8260, 524.2, and OLM4.1.
- Easily attaches in minutes.

Description	qty.	cat.#
Moisture Control By-Pass Line for Tekmar 3000	ea.	21035
Moisture Control By-Pass Line for Tekmar 3100	ea.	21109

20676

20675

23020

Photoionization (PID) Lamps

Model 108-10.0/10.6 offers both 10.0 and 10.6 eV potential, has a 0.781" base diameter, and is used in Tracor, OI, and Baseline instruments. Model 103 has a 1.375" base and is used in HNU and SRI detectors. Model 108-BTEX lamp's higher output makes it ideal for detection of BTEX compounds.

Features	Benefits
Longer life.	More for your money with each lamp.
Model 108-BTEX has 33% more output than older models.	Operate continuously at 1 ma and 250 °C for 6 months and still have better than 50% of the initial output.
Lamps individually tested.	Your lamp will work to specifications.
Variety of models.	Among the best lamps available for most instrumentation.

Description	eV Rating	Base	qty.	cat. #
PID Lamp, Model 103 C	10.2	1.375"	ea.	20676
PID Lamp, Model 108	10.0/10.6	0.781"	ea.	20675
PID Lamp, Model 108-BTEX	10.0/10.6	0.781"	ea.	23020
PID Lamp Polishing Kit (contains iron oxide cleaning compound, swabs, and instructions)			kit	20674

Make Life Easier (MLE) Capillary Tool Kits

Everything you need in one complete kit!

All kits include these components:

- 1/8", 3/16", 1/4" nylon brushes
- 1/4", 3/8", 3/16" stainless steel wire tube brushes
- stainless steel surface brush
- 6 stainless steel jet reamers (0.25–0.65 mm OD)
- 1/4" x 5/16" open end wrench
- 3/8" x 7/16" open end wrench
- rubber-tipped slide-lock tweezers
- scoring wafers
- inlet liner removal tool
- septum puller
- mini wool puller/inserter tool
- 4-inch tapered needle file
- swivel head flashlight
- mini hand drill set
- 15 cm compact steel ruler
- pocket magnifier
- high temperature string (1 meter)
- pipe cleaner (12-inch)
- cotton tip swabs (pk. of 25)

22186

22185

MLE Make Life Easier!

MLE tool kits conveniently provide the tools that make it easier to install and maintain capillary columns at a discounted price compared to buying the tools individually!

MLE Capillary Tool Kit for Agilent GCs (cat.# 22186) also includes:

- capillary installation gauge for Agilent GCs
- injector wrench for Agilent GCs
- septum nut removal tool
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for PerkinElmer GCs (cat.# 22185) also includes:

- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

MLE Capillary Tool Kit for Shimadzu GCs (cat.# 22182) also includes:

- capillary installation gauge for Shimadzu GCs
- injector wrench for Shimadzu GCs
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench

22184

22182

MLE Capillary Tool Kit for Thermo Scientific GCs (cat.# 22183) also includes:

- capillary installation gauge for Thermo Scientific GCs
- liner cap removing tool for Thermo Scientific GCs
- 6 mm x 7 mm open end wrench
- 8 mm x 10 mm open end wrench
- 16 mm x 17 mm open end wrench

MLE Capillary Tool Kit for Varian GCs (cat.# 22184) also includes:

- capillary installation gauge for Varian GCs
- 7/16" x 1/2" open end wrench
- 1/2" x 9/16" open end wrench

22183

Description	qty.	cat.#
MLE Capillary Tool Kit for Agilent GCs	kit	22186
MLE Capillary Tool Kit for PerkinElmer GCs	kit	22185
MLE Capillary Tool Kit for Shimadzu GCs	kit	22182
MLE Capillary Tool Kit for Thermo Scientific GCs	kit	22183
MLE Capillary Tool Kit for Bruker/Varian GCs	kit	22184

Easily seat ferrules for consistent installations!


21034


21399


22330


22335


22333

Capillary Installation Gauge

- Seats ferrules onto column for consistent installations.*
- Prevents crushed column ends.
- Made from high-quality stainless steel.

Using the capillary installation gauge for Agilent-style fittings.

Install the column nut and ferrule onto the column. Slide the column into the installation gauge to the recommended insertion distance. Finger-tighten the nut.

Tighten the assembly to ensure a properly seated ferrule. Loosen the assembly and remove the column and column nut.

The ferrule will be properly seated, and should remain in place when light force is applied. If it slides loosely on the column, repeat procedure.

Description	qty.	cat.#
Capillary Installation Gauge for Agilent-style fittings (compact ferrules)	ea.	21034
Capillary Installation Gauge for 1/16" fittings (1/16" ferrules)	ea.	21399
Capillary Installation Gauge for Bruker/Varian GCs for use with 1/16" ferrules	ea.	22335
Capillary Installation Gauge for Shimadzu 17A, 2010, and 2014 GCs	ea.	22333
Capillary Installation Gauge for Thermo Scientific TRACE & Focus SSL (M4 ferrules)	ea.	22330

*For use with graphite ferrules only.

restek innovation!


21894

Capillary Installation Gauge for Agilent 5973/5975 MS

- Seats ferrules onto column for consistent installations.
- Made from high-quality stainless steel.

Install the nut and ferrule onto the column, then insert the column through the installation tool, exposing several centimeters at the exit end. Tighten the nut (not depicted).

Score and remove the exposed end of the column.

Loosen the nut.

Description	Similar to Agilent part #	qty.	cat.#
Capillary Installation Gauge for Agilent 5973/5975 MS	G1099-20030	ea.	21894


22858


21044

Capillary Column Caps

- Attach to the column in seconds to form an airtight seal.
- Increase column lifetime—prevent moisture and air from entering the column during storage.
- Two styles to choose from: glass or silicone material.
- Glass caps are color-coded for identifying detector and injector ends.
- Not recommended for reuse.

Description	Material	qty.	cat.#
Capillary Column Caps	glass	10-pk.	21044
Capillary Column Caps	Silicone	10-pk.	22858

23015

Scoring Wafer With Handle

- Ceramic wafer is straight-edged for cutting fused silica tubing cleanly.
- Unique, ergonomic handle is made of soft, comfortable rubber.

Description	qty.	cat.#
Scoring Wafer with Handle	2-pk.	23015

Ceramic Scoring Wafer

Four straight scoring edges for cutting fused silica tubing and four serrated edges for cutting MXT® metal capillary columns.

20116

Exert just enough pressure to put a slight arc in the tubing. Pull perpendicularly across the tubing. The tubing should fall off or break with a slight tap of the wafer.

Check the cut against the white of the scoring wafer. Look for a clean, square cut.

Description	qty.	cat.#
Ceramic Scoring Wafers	5-pk.	20116

Sapphire Scribe

20182

- Cuts fused silica tubing.
- Produces a clean, square cut.

One quick stroke...

...and just a tap leaves a clean, square end.

Description	qty.	cat.#
Sapphire Scribe	ea.	20182

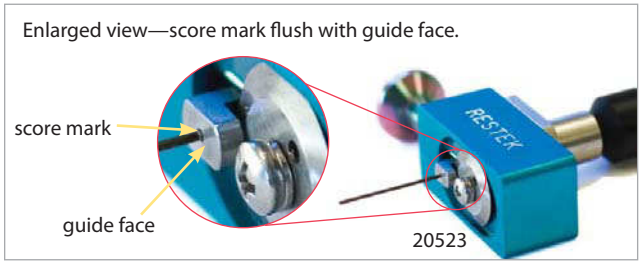
23027

Shortix® Capillary GC Column Cutter

- Consistently make precise, clean, square cuts with a diamond blade.
- Built-in magnifier to verify square cut.
- Use with 0.25 mm ID to 0.53 mm ID tubing (0.78 mm OD maximum).

23026

Description	qty.	cat.#
Shortix Capillary GC Column Cutter	ea.	23026
Maintenance Kit for Shortix Capillary GC Column Cutter (Includes: diamond cutting wheel, O-rings, and a tool to open the column cutter)	kit	23027



20523

Restek Tubing Scorer for MXT® Columns

- Makes a perfect cut every time.
- Easy to use.
- Leaves column entrance perfectly round.
- Ideal for creating a leak-free seal with connectors and valves.

Metal MXT® columns are easy to cut. Scoring wafers can be used, but may leave the column end irregularly shaped. The Restek tubing scorer is designed to make a perfect cut every time, leaving the column entrance perfectly round.

Description	qty.	cat.#
Restek Tubing Scorer for MXT Columns (0.25-0.53 mm ID & 0.5-0.8 mm OD)	ea.	20523
Replacement Scoring Wheel	ea.	20522

Inlet Liner Removal Tool

- Easily remove liner from injector—no more burned fingers.
- Made from high-temperature silicone.
- Won't chip or crack the liner.

20181

No more burned fingers!



Description	qty.	cat.#
Inlet Liner Removal Tool	3-pk.	20181

26262

The Claw and The Claw Holder Kit

- Easily removes hot liners from injection ports.
- 4 mL vials (not included) can be replaced when dirty.

Never again will you burn your fingers removing a hot injection port liner. The Claw safely and cleanly removes liners, O-rings, or other small objects from the injection port. You can then place the hot objects in a clean 4 mL vial situated in The Claw holder until ready for reuse.

Description	qty.	cat. #
The Claw	ea.	26261
The Claw Holder Kit (includes The Claw and holder)	kit	26262
WISP 48 Snap Seal Vial	100-pk.	24658

Eliminates user variation!

Inlet Liner Packing Tool

- Position wool reproducibly every time.
- Accurate to a specific, measured depth.
- Can be used with all manufacturers' liners.

Loosen the nut on the side of the tool and adjust the gauge to the manufacturer's recommended depth.

Place a plug of loosely bound wool at the top of the inlet liner.

Insert the liner packing tool into the liner until the tool bottoms out. Remove the tool. The wool is now positioned correctly in the liner and the liner is ready for use.

Description	qty.	cat.#
Inlet Liner Packing Tool	ea.	20339

Recommended for inlet liners with an ID ≥ 2 mm.

Injector Wrench for Agilent 5890/6890/6850 GCs

- Use to remove the septum nut and weldments during GC maintenance.
- Use the smaller end to remove the septum nut.
- Use the larger end to tighten the split/splitless weldment nut.
- High-quality stainless steel construction.
- Meets original equipment performance.


22065

Description	Similar to Agilent part #	qty.	cat.#
Injector Wrench for Agilent 5890/6890/6850 GCs	19251-00100	ea.	22065


21159

Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs

- Designed specifically for removing Shimadzu injection ports.
- High-quality stainless steel construction.

Description	Similar to Shimadzu part #	qty.	cat.#
Injector Wrench for Shimadzu 17A, 2010, and 2014 GCs	221-46977-00	ea.	21159


22334

Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge

Description	qty.	cat.#
1/4" x 5/16" and 10 mm x 11 mm Open-End Wrench Set for use with Shimadzu 17A, 2010, and 2014 Capillary Installation Gauge	ea.	22334


20387

Open-End Wrench Set

High-quality 1/4" x 5/16", 3/8" x 7/16", 7/16" x 1/2", and 1/2" x 9/16" wrenches for tightening a wide variety of chromatography fittings.

Description	qty.	cat.#
Open-End Wrench Set	set	20387


20110

Open-End Wrenches

High-quality wrenches for tightening capillary fittings.

Description	Size	qty.	cat.#
Open-End Wrenches	1/4" x 5/16"	2-pk.	20110
Open-End Wrenches	3/8" x 7/16"	2-pk.	22455


22997

Metric Wrench Set

High-quality 6 x 7 mm, 8 x 10 mm, and 16 x 17 mm wrenches for tightening a wide variety of fittings.

Description	qty.	cat.#
Metric Wrench Set	set	22997


22999

Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999


22998

12-Piece, Ball-Point Hex Key Set

Includes twelve hex keys (Allen wrenches): 0.050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#
12-Piece, Ball-Point Hex Key Set	set	22998


23034

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.

20109

High-Temperature String

Use to restring capillary columns, attach column connectors to column cages, or hold the column in the GC oven. Capable of withstanding temperatures to 400 °C.

Description	qty.	cat.#
High-Temperature String	10 m	20109
High-Temperature String	450 m	20618

20101

Slide-Lock Tweezers and 15 cm Compact Steel Ruler

- "Lock" capillary columns to the correct insertion distance recommended by the instrument manufacturer during installation.
- Useful for many laboratory tasks.

This duo provides an alternative way to install capillary columns to the correct insertion distance recommended by the instrument manufacturer.

Description	qty.	cat.#
Slide-Lock Tweezers and 15 cm Compact Steel Ruler	set	20101

20112

Stainless Steel Tube Brushes/Surface Brush

Unlike brass brushes that can leave a metal residue, these stainless steel tube brushes ($^3/_8$-, $^3/_{16}$-, and $^1/_4$-inch) work well for cleaning dirty collectors, injector ports, and detector ports. The surface brush can be used to remove residue that builds up on metal detector jets and electronic contacts.

Description	qty.	cat.#
Stainless Steel Tube Brushes/Surface Brush	4-piece set	20112

20108

Nylon Tube Brushes and Pipe Cleaner

Use to remove small septum fragments and residue from dirty glass inlet liners. Brushes are $^1/_8$-, $^3/_{16}$-, and $^1/_4$-inch in diameter; pipe cleaner is one foot (30 cm) long.

Description	qty.	cat.#
Nylon Tube Brushes and Pipe Cleaner	4-piece set	20108

20106

4" Tapered Needle Files

These files can be used for many purposes. They are especially useful for removing ferrules that are lodged in injector or detector ports.

Description	qty.	cat.#
4" Tapered Needle Files	2-pk.	20106

21601

MXT® Needle Files

Multi-purpose files especially useful for cutting Siltek® treated stainless steel columns.

Description	qty.	cat.#
MXT Needle Files	2-pk.	21601


20122

Mini Hand Drill Set

Drill ferrules to the proper ID in seconds! Includes three drills, for use with 0.25, 0.32, and 0.53 mm ID (0.4, 0.5, and 0.8 mm OD) capillary columns.

Description	qty.	cat.#
Mini Hand Drill Set	3-piece set	20122


20113

Stainless Steel Jet Reamers

A great tool for cleaning detector jets or removing stuck ferrules from other small orifices. Serrated design is optimal for removing silica deposits and other contaminants.

Description	qty.	cat.#
Stainless Steel Jet Reamers	6-piece set	20113

20124

Pocket Magnifier

- Small and easy to handle.
- 10x magnification makes it easy to see the column end to verify a square cut.

Description	qty.	cat.#
Pocket Magnifier	ea.	20124


22066

GC Oven Thermometer

- Verify GC oven temperature.
- Quick measurements via sensor in the measuring tip.
- Swivel head can turn 180°.
- Wide measuring range: -50°C to +350°C.

Description	qty.	cat.#
GC Oven Thermometer	ea.	22066


22187

Flashlight with Swivel Head

- Ideal for tight spaces—like inside a GC oven.
- Uses two AA batteries (included).

Description	qty.	cat.#
Flashlight with Swivel Head	ea.	22187


20117

Septum Puller

- Use hooked end for removing septa and O-rings; pointed end works well for removing stuck ferrules or debris.
- Keep several on hand in your laboratory for other uses, too.


Dislodge a stuck ferrule quickly and easily—without scoring the fitting.


Remove a septum without damaging an expensive weldment.

Description	qty.	cat.#
Septum Puller	ea.	20117

GC Accessories

Gas Management

Restek provides the following total gas system solution:

- Restek gas purifiers provide cost-effective gas purity assurance.
- Restek stainless steel and copper tubing is precleaned and ready to use.
- Swagelok® and Parker A-Lok® tube fittings consistently deliver high-quality performance.
- Extensive line of hand tools, including Restek's Electronic Leak Detector, to make your work easier and faster.
- Gas generators offer an uninterrupted supply of gas.
- Gas regulators ensure optimum line pressure control of all your chromatography gases.

Restek Technical Service (1-800-356-1688, ext. 4; 1-814-353-1300, ext. 4; or support@restek.com) or your Restek representative can answer your questions and provide system-design advice. From the gas source to your point of use, we offer the products and services that ensure the purity of your gas.

Why do I need to use traps and where should I install them?

Carrier gas must contain less than 1 ppm of oxygen, water vapor, or any other trace contaminant to prevent column degradation, shortened column lifetime, and increased stationary phase bleed. Contaminants cause ghost peaks to appear during temperature programming and degrade the validity of analytical data. The expense of using high-purity gases in combination with carrier gas purifiers will be offset by longer column lifetime and less instrument maintenance.

Moisture Removal

Moisture in carrier gas lines will prematurely degrade oxygen and hydrocarbon traps and increase detector noise (particularly with ECDs). As a precaution, we highly recommend installing a moisture trap before the hydrocarbon and oxygen traps on all carrier gas lines. Our favorite trap is the Super-Clean ultra-high capacity moisture filter (cat.# 22028, p. 267).

Hydrocarbon Removal

Use a hydrocarbon trap if your gas has a potential source of hydrocarbon contaminants (e.g., an oil pump in an air compressor) or if you suspect you are observing carrier gas ghost peaks. Install the hydrocarbon trap after the moisture trap to prevent moisture from degrading the hydrocarbon-trapping ability of the activated carbon in the hydrocarbon trap. We recommend the Super-Clean ultra-high capacity hydrocarbon filter (cat.# 22030, p. 267).

Oxygen Removal

Oxygen is a column killer and can enter the system at any connection that is leaking. It is present even in ultra-high purity gases, as minute leaks at fittings allow oxygen to influx against the concentration gradient. There are many choices for oxygen removal—the Super-Clean ultra-high capacity oxygen Filter (cat.# 22029, p. 267) is popular with Restek chemists. Because oxygen can enter a gas line at any fitting, the oxygen trap should be the last connection before the gas line enters the chromatograph.

Leak Checking

To prevent column degradation, increase column lifetime, and decrease stationary phase bleed, carrier gas should always contain <1 ppm oxygen. This can be monitored by continually leak checking all gas system connections using the Restek Electronic Leak Detector (cat.# 22839, p. 266).

for more info

Questions about which carrier gas purifier to use?
Call Restek Technical Service at 1-814-353-1300, ext. 4, or contact your Restek representative to discuss your application.

Gas Managment System, Leak Detector

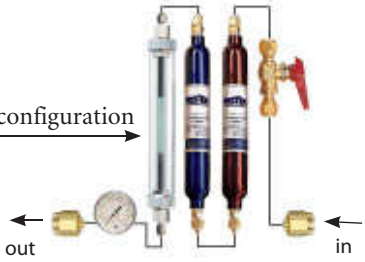
Restek Gas Management System

- Removes moisture, hydrocarbons, and oxygen from carrier gas, extending column lifetime.
- Produces high-purity carrier gas for most applications.
- Includes one each: moisture, hydrocarbon, and indicating oxygen trap.
- Replacing traps is safe and easy.
- Maximum flow: 1 liter/minute.

Restek has put together a convenient unit providing gas purification all in one step. Complete with an indicating trap, your gas purification issues are handled in one central location.

Dimensions:
12" x 14" x 3"
(30.5 x 35.6 x 7.6 cm)

trap configuration



did you know?

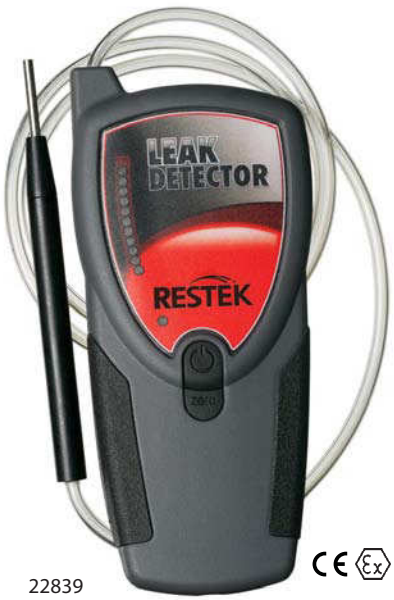
The Restek Gas Management System removes water vapor (to 10 ppb), hydrocarbons (to 0.1 ppm), and oxygen (to less than 0.1 ppm) with three traps housed in one unit.

Description	Fittings	qty.	cat.#
Restek Gas Management System	includes fittings for 1/8" and 1/4" gas line	kit	21999
Replacement Traps		**qty.**	**cat.#**
High-Capacity Moisture Trap	1/8" Nickel-Plated Brass	ea.	21997
Capillary-Grade Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	21991
Indicating Oxygen Trap	1/8" Brass	ea.	22010

Restek Electronic Leak Detector

Don't let a small leak turn into a costly repair—protect your analytical column by using a Restek Leak Detector.

Backed by a 1-year warranty, the Restek Leak Detector is the industry standard for performance and affordability in handheld leak detectors.



22839

Leak Detector Facts	
Detectable Gases:	Helium, nitrogen, argon, carbon dioxide, hydrogen
Battery:	Rechargeable Ni-MH internal battery pack (6 hours normal operation)
Operating Temperature Range:	32–120 °F (0–48 °C)
Humidity Range:	0–97%
Warranty:	1-year
Certifications:	CE, Ex, Japan
Compliance:	WEEE, RoHS

Description	qty.	cat.#
Leak Detector With Hard-Sided Carrying Case and Universal Charger Set (U.S., UK, European, Australian)	ea.	22839
Leak Detector Routine Maintenance Review**	ea.	22839-R
Soft-Side Storage Case	ea.	22657
Small Probe Adaptor	ea.	22658

Avoid using liquid leak detectors on a GC! Liquids can be drawn into the system.

*Caution: The Restek Electronic Leak Detector is designed to detect trace amounts of hydrogen in a noncombustible environment. It is NOT designed for determining leaks in a combustible environment. A combustible gas detector should be used for determining combustible gas leaks under any condition. When using it to detect hydrogen, the Restek Electronic Leak Detector may only be used for determining trace amounts in a GC environment.

**Routine maintenance includes inspection of the probe tip, internal/external tubing, and a battery replacement.

22658

Verify hard-to-reach leaks using the small probe adaptor (sold separately).

restek recommends

When your Leak Detector batteries need to be replaced, send the unit to us for a routine maintenance review to ensure continued sensitivity and reliability. We will replace not only the batteries, but also the probe and internal/external tubing. We will also recertify your unit. Contact Customer Service to send in your Leak Detector for maintenance (cat. #22839-R).

Restek Super-Clean Gas Filter Kits and Replacements

- High-purity output ensures 99.9999% pure gas (at max. flow of 2 L/min.).
- "Quick connect" fittings for easy, leak-tight cartridge changes.
- Glass inside to prevent diffusion; polycarbonate housing outside for safety.
- All traps measure 10 5/8" x 1 3/4" (27 x 4.4 cm).
- Each base plate unit measures 4" x 4" x 1 7/8" (10.2 x 10.2 x 4.8 cm).


22022

Table I: Each Super-Clean gas filter provides high-purity outlet gas.

Type of Filter	Outlet Gas Quality (%)	Maximum Pressure/ Maximum Flow Rates	Use for:	Indicator Color Change	Capacity H_2O (g)	Capacity O_2 (mL)	Capacity Hydrocarbons (g)	Estimated Lifetime (years)
Moisture cat.# 22028	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	Yellow/orange to clear	7.2	—	—	>2
Oxygen cat.# 22029	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas	Green to grey	—	1,000	—	>2
Hydrocarbons cat.# 22030	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	No indicator	—	—	12[3]	>2
Fuel Gas[1] cat.# 22022	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas Air Hydrogen	Yellow/orange to clear	3.5	—	24[3]	>1.5
Triple[2] cat.# 22020	>99.9999	11 bar 159 psi/ 7 L/min	Inert carrier gas	Yellow/orange to clear Green to grey	1.8	500	4[3]	>1
Helium Specific[2] cat.# 21982	>99.9999	11 bar 159 psi/ 7 L/min	Helium	Yellow/orange to clear Green to grey	1.8	500	—	>1

[1]Removes hydrocarbons and moisture.
[2]Removes hydrocarbons, moisture, and oxygen.
[3]As *n*-butane.

did you know?

All Restek Super-Clean gas filter cartridges (except hydrocarbon filter cat.# 22030) feature easy-to-read indicators. The indicator code is shown on every trap, so there is no confusion about when to replace it.


22020


21982


base plate

Description	qty.	cat.#
Carrier Gas Cleaning Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and oxygen/moisture/hydrocarbon triple gas filter	kit	22019
Fuel Gas Purification Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and hydrocarbon/moisture fuel gas filter	kit	22021
Ultra-High Capacity Hydrocarbon Filter	ea.	22030
Ultra-High Capacity Moisture Filter	ea.	22028
Ultra-High Capacity Oxygen Filter	ea.	22029
Replacement Triple Gas Filter (removes oxygen, moisture, and hydrocarbons)	ea.	22020
Replacement Fuel Gas Filter (removes moisture and hydrocarbons)	ea.	22022
Helium-Specific Carrier Gas Cleaning Kit Includes: mounting base plate, 1/8" inlet/outlet fittings, and oxygen/moisture/hydrocarbon helium-specific filter	kit	21983
Replacement Helium-Specific Gas Filter (removes oxygen, moisture, and hydrocarbons)	ea.	21982
Gas Filter Bundle Kit Includes: one triple gas filter (cat.# 22020) and two fuel gas filters (cat.# 22022)	kit	22031

tech tip

Oxygen and Moisture Traps
Restek highly recommends oxygen and moisture traps for make-up gas when operating sensitive detectors such as electron capture detectors (ECD). The hydrogen reaction gas for sensitive electrolytic conductivity detectors (ELCD) also requires a hydrocarbon trap to remove trace impurities.

Super-Clean Gas Filters

22026

22025

22027

Restek Filter Base Plates

- Standard base plate fittings are 1/8". To adapt to 1/4", order 1/8" to 1/4" tube-end unions.
- End fittings available in brass or stainless steel.
- Base plates fit all stand alone Super-Clean gas filters offered.

		Brass		Stainless Steel
Description	**qty.**	**cat.#**	**qty.**	**cat.#**
Filter Base Plate, Single-Position	ea.	22025	ea.	22344
Filter Base Plate, 2-Position	ea.	22026	ea.	22345
Filter Base Plate, 3-Position	ea.	22027	ea.	22346

Wall Mounting Bracket

Base plates can be mounted by using screws and the mounting holes on the base plate, or by using this optional wall mounting bracket.

21984

Description	**qty.**	**cat.#**
Wall Mounting Bracket for Super-Clean Base Plates	ea.	21984

Replacement O-Rings for Cartridge Base Plates

Pack includes 10 large O-rings and 10 small O-rings.

22023

Description	**qty.**	**cat.#**
Replacement O-Rings for Cartridge Base Plates	20-pk.	22023

1/8-Inch to 1/4-Inch Tube-End Unions

To adapt 1/8" Super-Clean base plate fittings to 1/4", use 1/8" to 1/4" tube-end unions.

21833

		Brass		Stainless Steel
Description	**qty.**	**cat.#**	**qty.**	**cat.#**
Tube-End Reducer, 1/8" tube to 1/4"	5-pk.	21833	2-pk.	21933

Restek Super-Clean Gas Trapping System for LC-MS

A Super-Clean quick-change cartridge system efficiently removes hydrocarbons from nitrogen!

- Changing filters is quick and easy.
- Up to 20 L of hydrocarbon-free nitrogen per minute.
- Filters connected in parallel to handle high flows of LC-MS.

20 L of purified nitrogen per minute!

Super-Clean gas filters provide high-purity outlet gas	
Type of filter:	Hydrocarbon (charcoal)
Max. Flow:	20 L/min
Outlet Gas Quality %:	99.9999%
Maximum Pressure:	11 bar/159 psi
Estimated Lifetime:	3 to 6 months

Description	**qty.**	**cat.#**
Super-Clean Gas-Trapping System (2-position base plate, 2 charcoal filters)	ea.	22062
Replacement Hydrocarbon (Charcoal) Filters	2-pk.	22061
Particle Drop-In Filter, 0.5 µm	2-pk.	22367

also available

Looking for a nitrogen generator for your LC-MS?

Restek offers a full line of Parker LC-MS generators.

See **page 277.**

Restek Click-On In-Line Super-Clean Purification Gas Traps

- High-purity output ensures 99.9999% pure gas.
- Click-On fittings for easy, leak-tight cartridge changes; brass or stainless steel, 1/4" or 1/8".
- Helium-specific triple gas trap is ideal for GC-MS—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Triple gas trap is ideal for purifying carrier gas—it contains oxygen, moisture, and hydrocarbon scrubbers in one cartridge.
- Fuel gas trap is ideal for purifying flame ionization detector (FID) fuel gases, removing both moisture and hydrocarbons.

Click-On adaptor connectors allow cartridges to be exchanged without introducing oxygen, moisture, and hydrocarbons. Spring-loaded check valves seal when a filter is removed and open only when a new filter has been locked in place.

Filter Type	Gas Quality at Outlet	Maximum Pressure	Maximum Flow (L/min)	Use For	H_2O (g)	Capacity O_2 (mL)	Hydrocarbons (g) (*n*-butane)	Estimated Lifetime (years)
Moisture cat.# 22467	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H_2	15	NA	NA	>3
Oxygen cat.# 22468	>99.9999	11 bar 160 psi	25	Inert carrier gas	NA	2,000	NA	>3
Hydrocarbon cat.# 22466	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H_2	NA	NA	24	>3
Fuel Gas[1] cat.# 22465	>99.9999	11 bar 160 psi	25	Inert carrier gas, helium, air, H_2	7	NA	12	>2
Triple[2] cat.# 22464	>99.9999	11 bar 160 psi	25	Inert carrier gas	4	1,000	8	>2
Helium-Specific Triple[2] cat.# 22473	>99.9999	11 bar 160 psi	25	Helium	4	1,000	8	>2

[1]Removes hydrocarbons, moisture.
[2]Removes hydrocarbons, moisture, oxygen.

NOTE: Super-Clean gas filters are recommended for purifying noncorrosive gases with low concentrations of contaminants. The maximum concentration of oxygen in the incoming gas stream for oxygen purifiers is 0.5%.

See next page for more Click-On In-Line Super-Clean products.

Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

did you **know**?

Trap replacement depends on the quality of the incoming gas. Use the double connector and install an indicating cartridge after a trap to indicate when the trap should be replaced.

Restek Click-On In-Line Super-Clean Gas Traps and Connector Kits

Description	qty.	cat.#
Carrier Gas Purification Kit		
Includes: (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22456
Includes: (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22457
Includes: (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22458
Includes: (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon triple trap	kit	22459
Fuel Gas Purification Kit		
Includes: (4) 1/8" SS connectors and (2) hydrocarbon/moisture traps	kit	22460
Includes: (4) 1/8" brass connectors and (2) hydrocarbon/moisture traps	kit	22461
Includes: (4) 1/4" SS connectors and (2) hydrocarbon/moisture traps	kit	22462
Includes: (4) 1/4" brass connectors and (2) hydrocarbon/moisture traps	kit	22463

tech tip

To prevent settling of dessicant, mount vertically, not horizontally.

22474

Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

Click-On In-Line Super-Clean Indicator

- Oxygen: green to grey
- Moisture: beige to clear

Install an indicator after the Click-On in-line gas filter so there is no confusion about when to replace the traps.

Description	qty.	cat.#
Click-On In-line Super-Clean Indicator (oxygen, moisture)	ea.	22474

Note: Fittings sold separately.

22464

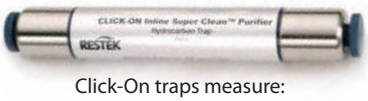
Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

Click-On In-Line Super-Clean Replacement Gas Traps

Description	qty.	cat.#
Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22464
Fuel Gas Trap (removes moisture and hydrocarbons)	ea.	22465

Note: Replacement trap only—fittings sold separately.

22466



Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)

Click-On In-Line Super-Clean Ultra-High Capacity Gas Traps

Description	qty.	cat.#
Ultra-High Capacity Hydrocarbon Trap	ea.	22466
Ultra-High Capacity Moisture Trap	ea.	22467
Ultra-High Capacity Oxygen Trap	ea.	22468

Click-On In-Line Super-Clean Connectors

22477

Click-On connectors allow you to change traps quickly, without introducing oxygen into your system.

Attach Click-On connectors to the gas lines once—avoid damaging the lines.

Each connector is 2 3/8" (6 cm) in length.

Description	Fittings	qty.	cat.#
Click-On In-line Super-Clean Connectors	1/8" Brass	2-pk.	22475
Click-On In-line Super-Clean Connectors	1/8" Stainless Steel	2-pk.	22476
Click-On In-line Super-Clean Connectors	1/4" Brass	2-pk.	22477
Click-On In-line Super-Clean Connectors	1/4" Stainless Steel	2-pk.	22478

Click-On In-Line Super-Clean Double Connector

Connects any Click-On trap to a Click-On indicator.

22479

Each double connector is 3" (8 cm) in length.

Description	qty.	cat.#
Click-On In-line Super-Clean Double Connector, Stainless Steel	ea.	22479

22480

22481

Accessories for In-Line Super-Clean Gas Traps and Connectors

Description	qty.	cat.#
Wall-Mounting Clamps for Click-On In-line Super-Clean Gas Traps	4-pk.	22480
Replacement O-Rings for Click-On In-line Super-Clean Connectors (includes 10 large and 10 small)	20-pk.	22481

Helium-Specific Click-On In-Line Super-Clean Gas Trap and Connector Kits

Helium-specific Click-On in-line Super-Clean gas trap and kits are designed specifically for purification of helium in GC-MS systems.

Description	qty.	cat.#
Helium-Specific Carrier Gas Cleaning Kits		
Includes: (2) 1/8" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22469
Includes: (2) 1/8" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22470
Includes: (2) 1/4" SS connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22471
Includes: (2) 1/4" brass connectors and (1) oxygen/moisture/hydrocarbon helium-specific triple trap	kit	22472
Replacement Trap		
Helium-Specific Replacement Triple Trap (removes oxygen, moisture and hydrocarbons)	ea.	22473

22473

Click-On traps measure:
8 1/2" x 1 1/4" (21.6 x 3.2 cm)


20623

Dimensions: 9 1/4" x 2" (23.5 x 5.1 cm)


22081

High-Capacity Indicating Oxygen Trap

- Indicator changes from dark blue to black as oxygen and water are trapped.
- Lasts longer than three smaller traps.
- Use with all carrier gases.
- Ambient operating temperature, 100 psi (689 kPa) operating pressure.
- Built-in frit traps microparticles.
- Outlet gas purity:
  O_2 < 0.1 ppm when inlet does not exceed 15 ppm.
  H_2O < 0.5 ppm when inlet does not exceed 10 ppm.
- Maximum operating pressure: 150 psi (1,034 kPa).
- Maximum flow: 16.5 L/min.

Description	Fittings	qty.	cat.#
High-Capacity Indicating Oxygen Trap	1/8" Compression Tube Brass	ea.	20624
High-Capacity Indicating Oxygen Trap	1/4" Compression Tube Brass	ea.	20623
Replacement Cartridge (fits 1/4" or 1/8" housing)		ea.	20625
Replacement O-Rings (5 small O-rings and 5 large O-rings)		kit	22081


22010

Dimensions: 10" x 1 1/4" (25.4 x 3.2 cm)

Indicating Oxygen Trap

- Indicator changes from light green to grey as oxygen is trapped.
- Heavy-walled glass body, protected by polycarbonate sleeve, prevents oxygen and water infusion.
- Prepurged for fast stabilization.
- 100 psi (689 kPa) maximum operating pressure.
- Reduces oxygen to 0.1 ppm.
- 10 µm frits at inlet and outlet.

Description	Fittings	qty.	cat.#
Indicating Oxygen Trap	1/8" Brass	ea.	22010
Indicating Oxygen Trap	1/4" Brass	ea.	22011


20600

Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)

High-Capacity Oxygen Trap

- Removes up to 600 mg of oxygen or 2 g of water.
- Long life—typically purifies more than five 200 ft^3 cylinders.
- Reduces oxygen to 15 ppb.
- Maximum operating pressure: 250 psi (1,724 kPa).
- Flow: 3 L/min @ 32 psi (221 kPa).

Description	Fittings	qty.	cat.#
High-Capacity Oxygen Trap	1/8" Nickel-Plated Brass	ea.	20601
High-Capacity Oxygen Trap	1/4" Nickel-Plated Brass	ea.	20600

Rechargeable Molecular Sieve S-Trap

- Traps water vapor; increases column and oxygen trap lifetime.
- Reduces baseline noise from sensitive detectors such as ECDs and mass spectrometers.
- Activated and ready to use.
- Reduces water to less than 1 ppm.
- Fits in GC oven for easy thermal recharging.
- Maximum flow: 1 L/min.


20685

Dimensions:
6 3/4" x 5 5/8" (17.1 x 14.3 cm)

Description	Fittings	qty.	cat.#
Rechargeable Molecular Sieve S-Trap	1/8" Brass	ea.	20686


21997

Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)
Moisture capacity: 16 g of water

High-Capacity Moisture Trap

- Purged with ultra-high-purity helium; ready to use.
- Reduces water to less than 15 ppb.
- Maximum operating pressure: 250 psi (1,724 kPa).
- Maximum flow: 1.25 L/min.

Description	Fittings	qty.	cat.#
High-Capacity Moisture Trap	1/8" Nickel-Plated Brass	ea.	21997
High-Capacity Moisture Trap	1/4" Nickel-Plated Brass	ea.	20638


22015

Dimensions: 13" x 2" (33 x 5.1 cm)
Moisture capacity: 6 g of water
Maximum flow: 1 L/min

Indicating Moisture Trap

- Reduces water to less than 10 ppb; indicator changes from yellowish-green to blue at 5% relative humidity.
- Prepurged for fast stabilization.
- Reduces noise from high-sensitivity detectors.
- Heavy-walled glass body prevents oxygen and water infusion.
- 10 µm frit prevents microparticulate damage to needle valves and flow controllers.
- Maximum operating pressure: 100 psi (689 kPa).

Description	Fittings	qty.	cat.#
Indicating Moisture Trap	1/8" Brass	ea.	22014
Indicating Moisture Trap	1/4" Brass	ea.	22015

21991

Dimensions: 11" x 1 1/2" (27.9 x 3.8 cm)

Capillary-Grade Hydrocarbon Trap

- Packed with an extremely high surface area, baked coconut shell–based activated carbon.
- Purged with ultra-high purity helium.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- Maximum operating pressure: 250 psi (1,724 kPa).

Description	Fittings	qty.	cat.#
Capillary-Grade Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	21991
Capillary-Grade Hydrocarbon Trap	1/4" Nickel-Plated Brass	ea.	21992

22012

Dimensions: 9 1/4" x 2 1/4" (23.5 x 5.7 cm)

Refillable Hydrocarbon Trap

- Removes trace impurities from carrier gas.
- Reduces organics to 0.1 ppm (assuming 100 ppm input).
- 60 µm frit prevents gas contamination by purifier particles.
- Good for purge and trap systems.
- Refillable and rechargeable.
- Maximum operating pressure: 125 psig (862 kPa).
- Maximum flow: 5 L/min.

Description	Fittings	qty.	cat.#
Refillable Hydrocarbon Trap	1/8" Nickel-Plated Brass	ea.	22012
Refillable Hydrocarbon Trap	1/4" Nickel-Plated Brass	ea.	22013
Carbon Refill (two recharges)		pint	20626

20636

Dimensions: 6" x 1 3/4" (15.2 x 4.4 cm)

Indicating Hydrocarbon Trap for Air Compressors

- Pass compressed air from an oil-filled air compressor through this trap to remove oil vapors and mist.
- Indicator changes from pale pink to deep pink.

Description	Fittings	qty.	cat.#
Indicating Hydrocarbon Trap for Air Compressors	1/8" Brass	ea.	20637
Indicating Hydrocarbon Trap for Air Compressors	1/4" Brass	ea.	20636

20698

Dimensions: 6" x 1" (15.2 x 2.5 cm)

High-Capacity Split Vent Trap

- Reduces the release of hazardous materials from the capillary split vent into the lab.
- Includes connecting lines and mounting kit.

Description	Fittings	qty.	cat.#
High-Capacity Split Vent Trap	1/8"	ea.	20698
High-Capacity Split Vent Trap	1/8"	5-pk.	20699

22017

Dimensions: 6" x 1" (15.2 x 2.5 cm)

ECD Vent Trap

- Reduces the release of hazardous materials from the ECD vent into the lab.
- Includes connecting lines and mounting kit.

Description	Fittings	qty.	cat.#
ECD Vent Trap	1/8"	ea.	22017

tech tip

Carrier Gas Purity

Carrier gas should contain less than 1 ppm of oxygen, moisture, or other trace contaminants, to prevent column degradation, increase column lifetime, and decrease stationary phase bleed.

The expense of using high-purity gases in combination with carrier gas line purifiers will be offset by longer column lifetime and less GC maintenance.

VICI® Mat/Sen® Gas-Specific Purifier Modules

- Replace separate oxygen, moisture, and hydrocarbon traps with one multiple-bed purifier, specific for purifying helium, hydrogen, nitrogen, or air.
- Reduce gas impurities from ppm to low ppb levels.
- Decrease baseline noise and increase GC-MS sensitivity.
- Prepurged with the specified gas to shorten downtime.

Dimensions:
21" x 1 1/2"
(53.3 x 3.8 cm)

Performance for these purifiers is optimized by incorporating a multiple-bed format that progressively lowers concentrations of contaminants at each successive bed. VICI® Mat/Sen® purifiers are guaranteed to produce gases that are purer than 99.9999%, when supplied with gas of 99.995% purity, and are prepurged with the specified gas to speed conditioning. Purifier capacity is approximately four tanks of gas at 99.995% (50 ppm) purity, and correspondingly longer for purer gases.

Please Note: We recommend using an indicating oxygen trap (e.g., cat.# 22029, pg. 267) downstream from a VICI® Mat/Sen® purifier to continually ensure gas purity and indicate absolute change-out time.

Specifications:	
Length:	21" (53.3 cm)
Diameter:	1.5" (3.8 cm)
Maximum Inlet Pressure:	1,000 psi (6895 kPa)
Maximum Recommended Flow:	500 mL/min
Pressure Drop from 120 psi (827 kPa) inlet at a flow of 0-500 mL/min:	<0.20 psi (1.4 kPa)
Compression End Fittings:	1/8" or 1/4", stainless steel
Shipping Weight:	3.04 lb. (1,300 g)

Gas-Specific Purifier Module	Compression Tube Fittings 1/4-inch qty.	1/4-inch cat.#	1/8-inch qty.	1/8-inch cat.#
Helium Purifier Module	ea.	22600	ea.	22601
Hydrogen Purifier Module	ea.	22602	ea.	22603
Nitrogen Purifier Module*	ea.	22604	ea.	22605
Air Purifier Module	ea.	22606	ea.	22607

*Warning: Do not use with nitrogen containing more than 500 ppm of oxygen. If the oxygen level in the stream exceeds 500 ppm, use an air purifier.

Dimensions: 13" x 1/2" (33 x 1.3 cm)

Thermal Gas High Capacity Purifier Replacement Getter Tube

Each replacement getter tube has 12 L oxygen and 35 L water vapor capacity at a minimum flow rate of 1 L/min and removes oxygen, water, carbon monoxide, carbon dioxide, hydrocarbons (except methane) to ppb levels; pure enough for MS. Typically requires replacement once per year.

Change tube when gas pressure drops.

Replacement Getter Tubes	qty.	cat.#
1/8" Fittings (Similar to Supelco part# 2-2396)	ea.	21661
1/4" Fittings (Similar to Supelco part# 2-2398)	ea.	21660

Replacement getter tubes must be used with a Thermal Gas Purifier housing unit.

Gas Pressure Gauge Kit

- Use an in-line pressure gauge to indicate when a thermal gas purifier getter tube should be replaced.
- Includes 1/8" tee and 0–100 psi (0-689 kPa) gauge.

21657

Description	qty.	cat.#
In-line Gas Pressure Gauge Kit for Thermal Gas Purifiers	kit	21657

Replacement Chemical Traps for Agilent GCs

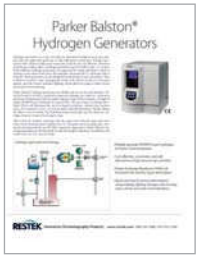
- Easy to install.
- Attach to same fittings as original manufacturer's equipment.
- Built-in frits retain fine particles; adsorbents remove both moisture and hydrocarbons.

Description	Similar to Agilent part #	qty.	cat.#
Replacement Split Vent Trap for Agilent 6890/6850 GCs	G1544-80550	ea.	22820
Replacement Chemical Trap for Agilent 5890 GCs	05890-61260	ea.	21610
Split Vent Line (32-inch) for Agilent GCs Includes: all installation hardware	19251-80525	2-pk.	22800
O-Rings for Agilent Trap Fittings	5180-4181	25-pk.	22064
Optional Split Vent Trap Assembly for Agilent 6890/6850 GCs	G1544-60610	kit	23031
Replacement Traps (2) and O-Rings (4)	G1544-80530	kit	23032

Parker Filtration

- Dimensions: 17.12" x 13.46" x 17.95"
- 59 lb. dry weight

Safer alternative to high-pressure gas cylinders!



free literature

Parker Balston® Hydrogen Generators

Download your free copy from **www.restek.com**

lit. cat.# GNTS1440-UNV

tech tip

Using purifying gas traps in combination with a gas generator can improve chromatography tremendously and extend column lifetime.

Parker Balston® PEM Hydrogen Generators

- Proton Exchange Membrane (PEM) cell eliminates the need for liquid electrolytes.
- Reliably generate 99.9995% pure hydrogen—for better chromatography.
- Eliminates high-pressure cylinders—greater convenience and improved lab safety.
- Compact unit, requiring only one square foot of bench space.
- Quick and easy to service and maintain; unique display lighting changes color for easy status checks and water level indication.
- Comes with a set of universal power adapters for U.S., European, and Asian plug types.
- Automatic safety feature shuts the generator down if a hydrogen leak is detected.

Specifications	
Purity:	99.9995% pure hydrogen
Delivery Pressure:	5-100 psig ± .05 psig (69-689 kPa ± 7kPa)
Outlet Port:	1/8" compression
Electrical Requirements:	100-230 VAC/50-60 Hz
Physical Dimensions:	17.12"h x 13.46"w x 17.95"d (43.48 x 34.19 x 45.6 cm)
Shipping Weight:	59 lbs. (27 kg) dry

Description	Model #	Capacity	qty.	cat.#
Hydrogen Generator	H2PEM-100	100 cc/min.	ea.	23065
Hydrogen Generator	H2PEM-165	165 cc/min.	ea.	23066
Hydrogen Generator	H2PEM-260	260 cc/min.	ea.	23067
Hydrogen Generator	H2PEM-510	510 cc/min.	ea.	23068
Replacement and Maintenance Components for Hydrogen Generators (for all models listed above)				
Replacement Desiccant Cartridge for H2PEM Generators			ea.	23069
6-Month Maintenance Kit for H2PEM Generators Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters			kit	23070
24-Month Maintenance Kit for H2PEM Generators Includes: 1 deionizer cartridge, 1 water filter, 3 environmental filters, 1 water level sensor, 1 water pump, and 1 desiccant cartridge			kit	23071

Parker Balston® Model FID-1000 and FID-2500 Gas Stations

- Single unit produces UHP zero air from house compressed air and 99.9995% pure hydrogen from deionized water.
- Ideal for supplying up to 5-6 FIDs.
- Eliminates inconvenient and dangerous gas cylinders.
- Silent operation, minimal operator attention required.

Parker Balston® gas stations provide both UHP grade hydrogen gas and zero grade air for flame ionization detectors. The system is specifically designed to supply gas to FIDs and to support flame thermionic and flame photometric detectors. The units produce zero air by purifying compressed air to a total hydrocarbon concentration of 0.1 ppm or less (measured as methane).

The hydrogen generators produce hydrogen gas from deionized water, using the principle of electrolytic dissociation of water and hydrogen proton conduction through a proton exchange membrane cell.

Specifications - FID Gas Stations:

Hydrogen Purity:	99.9995%
Zero Air Purity:	< 0.1 ppm total hydrocarbons as methane
Max. Hydrogen Flow Rate:	FID-1000: 90 cc/min
	FID-2500: 250 cc/min
Max. Zero Air Flow Rate:	FID-1000: 1000 cc/min
	FID-2500: 2500 cc/min
Power:	120 VAC/amp, 60 Hz, 480 watts
Hydrogen Outlet Pressure:	60 psig (414 kPa)
Zero Air Outlet Pressure:	40-125 psig* (276-862 kPa)
Inlet Connection:	1/4" NPT (female)
Outlet:	1/8" compression
Dimensions:	16.5"h x 10.5"w x 17"d
	(42 cm x 27 cm x 43 cm)
Weight:	53 lbs. (24kg)

Description	Model #	qty.	cat. #
Gas Station	Model FID-1000 (ideal for 1-2 FIDs)	ea.	20177
Gas Station	Model FID-2500 (ideal for 5-6 FIDs)	ea.	24913
Replacement Components for FID Gas Stations			
Resin Bed Cartridge for Hydrogen Generators in FID-1000 and FID-2500 Gas Stations		ea.	24914
Replacement Desiccant Cartridge		ea.	21671
FID Gas Station Maintenance Kit Includes: 1 desiccant cartridge, 1 resin bed cartridge, 1 filter cartridge		ea.	24915

*Zero air inlet requires minimum of 40 psig (276 kPa) compressed air pressure.

International Power Cord Sets

Just add the proper suffix to the catalog number for the gas generator you are ordering.

Location	qty.	cat.# suffix
United Kingdom (230 VAC, 50/50 Hz)	ea.	-550
European (230 VAC, 50/60 Hz)	ea.	-551
IEC Connector Only (230 VAC, 50/60 Hz)	ea.	-552
Japanese (200 VAC, 50/60 Hz)	ea.	-556
Japanese for Zero Air (100 VAC, 50/60 Hz)	ea.	-553
Japanese for Hydrogen (100 VAC, 50/60 Hz)	ea.	-554
Japanese for Nitrogen (100 VAC, 50/60 Hz)	ea.	-555

Produce zero air and pure hydrogen from one unit!

ordering **note**

For **international orders**, please add the appropriate power cord suffix from the table below.

free literature

FID Gas Stations

Download your free copy from **www.restek.com**

lit. cat.# GNTS1437-UNV

Select the power cord you need.

21654

free literature

Nitrogen Generators

Download your free copy from **www.restek.com**

lit. cat.# GNTS1442-UNV

ordering note

For **international orders**, please add the appropriate power cord suffix from the table below.

Parker Balston® Nitrogen Gas Generators

- Produces ultra-pure nitrogen (up to 99.9999%).
- Require only a compressed air source and 110 volt AC power.
- Typical applications include GC carrier gas, make-up gas, and low flow sample concentrators.
- Maintenance kits include replacement filters.

Specifications

	Model HPN2-1100 or UHPN2-1100	Model HPN2-2000
Maximum Nitrogen Flow Rate:	See Flow Table	2 L/min
Nitrogen Purity:	99.9999%	99.99%
Minimum/Maximum Inlet Pressure:	60 psig/125 psig (414/862 kPa)	75 psig/120 psig (517/827 kPa)
Electrical Requirements[1]:	120 VAC/60 Hz	120 VAC/60 Hz
Dimensions:	35" h x 12" w x 16" d (89 cm x 30 cm x 41 cm)	35" h x 12" w x 16" d (89 cm x 30 cm x 41 cm)
Shipping Weight:	115 lbs. (52 kg)	115 lbs. (52 kg)

Note:
Models HPN2-1100 and HPN2-2000 do not remove hydrocarbons.
[1]Power consumption is:
Model HPN2-1100 = 25 Watts
Model UHPN2-1100 = 700 Watts
Model HPN2-2000 = 25 Watts

Flow Table for Models HPN2-2000, HPN2-1100, and UHPN2-1100

Inlet Air Pressure	Maximum Outlet Flow (cc/min) Models HPN2-1100 and UHPN2-1100	Maximum Outlet Pressure
125 psig (862 kPa)	1100	85 psig (586 kPa)
110 psig (758 kPa)	1000	75 psig (517 kPa)
100 psig (689 kPa)	900	65 psig (448 kPa)
90 psig (621 kPa)	800	60 psig (414 kPa)
80 psig (552 kPa)	700	50 psig (345 kPa)
70 psig (483 kPa)	600	45 psig (310 kPa)
60 psig (414 kPa)	500	35 psig (241 kPa)
	Model HPN2-2000	
75-120 psig (517-827 kPa)	2000	90 psig (621 kPa)

Nitrogen Generators	Model #	qty.	cat.#
Nitrogen Generator	HPN2-2000 (high purity)	ea.	21654
Nitrogen Generator	HPN2-1100 (ultra-high purity)	ea.	21653
Nitrogen Generator	HPN2-1100 with European Cord Set	ea.	21653-551
Nitrogen Generator	HPN2-1100 with IEC Connector Only	ea.	21653-552
Nitrogen Generator	UHPN2-1100 (ultra-high purity zero grade)	ea.	20697
Maintenance Kits	**Model #**	**qty.**	**cat.#**
Maintenance Kit	for HPN2-1100, HPN2-2000, 76-96, 76-92	kit	21649
Maintenance Kit	for UHPN2-1100, 76-94	kit	21655

Select the power cord you need.

International Power Cord Sets

Just add the proper suffix to the catalog number for the gas generator you are ordering.

Location	qty.	cat.# suffix
United Kingdom (230 VAC, 50/50 Hz)	ea.	-550
European (230 VAC, 50/60 Hz)	ea.	-551
IEC Connector Only (230 VAC, 50/60 Hz)	ea.	-552
Japanese (200 VAC, 50/60 Hz)	ea.	-556
Japanese for Zero Air (100 VAC, 50/60 Hz)	ea.	-553
Japanese for Hydrogen (100 VAC, 50/60 Hz)	ea.	-554
Japanese for Nitrogen (100 VAC, 50/60 Hz)	ea.	-555

Parker Balston® Nitrogen Gas Generators for LC-MS

- Turn compressed air into ultra-pure nitrogen (up to 99.5%).
- Flows from 1 to 44 L/min.
- Models N2-04, N2-14, N2-22, and N2-35 require no electricity.
- Safe, reliable, low maintenance.
- Maintenance kits include replacement filters.

22130

22129

Specifications	NitroFlow Lab	N2-04	N2-14 or N2-14A	N2-22 or N2-22A	N2-35 or N2-35A
Maximum Nitrogen Flow Rate:	32 L/min	8 L/min	36 L/min max. flow	N2-22: 44 L/min N2-22A: 29 L/min	44 L/min
Nitrogen Purity:	99.50%	99%	95.0%–99.5%	99%	99%
Min/Max Inlet Pressure:	N/A	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig
Electrical Requirements:	120 VAC/60 Hz	None	N2-14: None N2-14A: 120 VAC/60 Hz	N2-22: None N2-22A: 120 VAC/60 Hz	N2-35: None N2-35A: 120 VAC/60 Hz
Dimensions:	27.6" h x 35.4" w x 12.2" d (70 cm x 90 cm x 31 cm)	11" h x 13" w x 16" d (27 cm x 34 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)
Shipping Weight:	205 lb (93 kg)	43 lb (20 kg)	N2-14: 75 lb (34 kg) N2-14A: 80 lb (36 kg)	N2-22: 101 lb (46 kg) N2-22A: 106 lb (48 kg)	N2-35: 115 lb (52 kg) N2-35A: 119 lb (54 kg)

Nitrogen Generators for LC-MS	Model #	qty.	cat.#
Nitrogen Generator for LC-MS	NitroFlow Lab Model, 32 L/min max. flow	ea.	22129
Nitrogen Generator for LC-MS	N2-04 Model for ELSD, 8 L/min max. flow	ea.	22130
Nitrogen Generator for LC-MS	N2-14 (general purpose) 36 L/min max. flow	ea.	20677
Nitrogen Generator for LC-MS	N2-14 with European Power Cord	ea.	20677-551
Nitrogen Generator for LC-MS	N2-14A (general purpose w/oxygen analyzer) 36 L/min max. flow	ea.	21652
Nitrogen Generator for LC-MS	N2-22 Model, 44 L/min max. flow	ea.	22131
Nitrogen Generator for LC-MS	N2-22A Model, 29 L/min max. flow	ea.	22132
Nitrogen Generator for LC-MS	N2-35 Model, 44 L/min max. flow	ea.	22133
Nitrogen Generator for LC-MS	N2-35A Model, 44 L/min max. flow	ea.	22134
Maintenance Kits	**Model #**	**qty.**	**cat.#**
Maintenance Kit	for N2-14, N2-14A, 75-72, 75-720NA	kit	21648
Maintenance Kit With Carbon Filter	for N2-14, N2-14A, 75-72, 75-720NA	ea.	22135

20677

ordering note

For **international orders**, please add the appropriate power cord suffix from the table on the previous page.

Parker Balston® Zero Air Generators

- Turn in-house compressed air into ultra-pure air (<0.1 ppm total hydrocarbons).
- Remove hydrocarbons to less than 0.1 ppm by catalytic oxidation.
- Operate at 40–125 psi (276–862 kPa).
- Typical payback is less than one year, based on cylinder costs.
- Install easily and take up little bench space.
- Maintenance kits include a one year supply of prefilters and final filter.

Model	Number of FIDs*
75-83NA	Up to 2
HPZA-3500	Up to 8
HPZA-7000	Up to 16
HPZA-18000	Up to 40
HPZA-30000	Up to 66

*Based on a 450 cc/min fuel air rate

Specifications

Maximum Zero Air Flow Rate:	75-83NA	1 L/min
	HPZA-3500	3.5 L/min
	HPZA-7000	7 L/min
	HPZA-18000	18 L/min
	HPZA-30000	30 L/min
Outlet Hydrocarbon Concentration (as methane):	75-83NA	< 0.1 ppm
	HPZA-30000	< 0.1 ppm
	Other Models	< .05 ppm
Minimum/Maximum Inlet Air Pressure:	40 psig/125 psig (276/862 kPa)	
Maximum Inlet Hydrocarbon Concentration (as methane):	100 ppm	
Pressure Drop at Maximum Flow Rate:	4 psi (28 kPa) differential	
Maximum Inlet Air Temperature:	78°F (25°C)	
Inlet/Outlet Ports:	1/4" NPT (female)	
Start-up Time to Specified Hydrocarbon Concentration:	45 minutes	
Electrical Requirements:	75-83NA	120 VAC/60 Hz, 0.5 amps
	HPZA-3500, HPZA-7000	120 VAC/60 Hz, 2.0 amps
	HPZA-18000, HPZA-30000	120 VAC/60 Hz, 4.0 amps
Dimensions:	75-83NA	12"h x 10"w x 3"d (30 cm x 25 cm x 8 cm)
	Other Models	16"h x 11"w x 13"d (42 cm x 27 cm x 34 cm)
Shipping Weight:	75-83NA	7 lbs. (3 kg)
	Other Models	41 lbs. (19 kg)

ordering note

For **international orders**, please add the appropriate power cord suffix from the table below.

Zero Air Generator	Model #	Capacity	qty.	cat. #
Zero Air Generator	75-83NA	1,000 cc/min	ea.	20684
Zero Air Generator	75-83NA with United Kingdom Power Cord	1,000 cc/min	ea.	20684-550
Zero Air Generator	HPZA-3500	3,500 cc/min	ea.	20680
Zero Air Generator	HPZA-3500 with European Power Cord	3,500 cc/min	ea.	20680-551
Zero Air Generator	HPZA-7000	7,000 cc/min	ea.	20681
Zero Air Generator	HPZA-18000	18,000 cc/min	ea.	20682
Zero Air Generator	HPZA-30000	30,000 cc/min	ea.	20683
Maintenance Kits (includes a one-year supply of prefilters and final filter)			**qty.**	**cat. #**
Maintenance Kit	for 75-83NA		kit	21646
Maintenance Kit	for HPZA-3500, HPZA-7000, HPZA-18000, HPZA-30000		kit	21647
Replacement Catalyst Towers	**Model #**	**Capacity**	**qty.**	**cat. #**
Replacement Catalyst Tower	for 75-83NA	1,000 cc/min	ea.	22005
Replacement Catalyst Tower	for HPZA-3500	3,500 cc/min	ea.	22004
Replacement Catalyst Tower	for HPZA-7000	7,000 cc/min	ea.	22006
Replacement Catalyst Tower	for HPZA-18000	18,000 cc/min	ea.	22007
Replacement Catalyst Tower	for HPZA-30000	30,000 cc/min	ea.	22008

*Parker Model 75-83NA (Restek cat.# 20684) is a wall-mount model, and its dimensions are 10" x 12" x 3".

free literature

Zero Air Generators

Download your free copy from **www.restek.com**

lit. cat.# GNTS1439-UNV

International Power Cord Sets

Just add the proper suffix to the catalog number for the gas generator you are ordering.

Location	qty.	cat.# suffix
United Kingdom (230 VAC, 50/50 Hz)	ea.	-550
European (230 VAC, 50/60 Hz)	ea.	-551
IEC Connector Only (230 VAC, 50/60 Hz)	ea.	-552
Japanese (200 VAC, 50/60 Hz)	ea.	-556
Japanese for Zero Air (100 VAC, 50/60 Hz)	ea.	-553
Japanese for Hydrogen (100 VAC, 50/60 Hz)	ea.	-554
Japanese for Nitrogen (100 VAC, 50/60 Hz)	ea.	-555

Silcosteel® Regulators and Switchover Systems

Applications:

- CEM continuous emission monitoring.
- Environmental stack and gas emission standards.
- Low-level sulfur and mercury analysis.
- Reactive or corrosive gases.
- Off-shore platform systems.
- Corrosive and salt water exposure.

Single- and dual-stage regulators and switchover systems are available with Silcosteel® surface treatment. This proprietary passivation process, developed by SilcoTek, provides excellent inertness for sulfur and mercury calibration standards and improved corrosion resistance over bare 316L stainless steel or other more expensive alloys.

Silcosteel®-treated sampling and transfer systems allow oil and gas exploration companies, chemical and petrochemical plants, and refineries to obtain accurate sulfur and mercury data the first time, every time, with no delay, sample errors, or false readings, down to part-per-billion (ppb) levels. Analysts charged with monitoring sulfur and mercury levels in process streams can save thousands of dollars in improved yields, better test cycle times, and improved system reliability.

Silcosteel® Regulators (Dual Stage & Single Stage)

Description	qty.	cat.#
Single-Stage Regulator		
CGA 330 (H_2S and other reduced sulfurs)	ea.	21361-5
CGA 350 (H_2, P_5)	ea.	21361-6
CGA 660 (NO, NO_2, SO_2)	ea.	21361-11
Dual-Stage Regulator		
CGA 330 (H_2S and other reduced sulfurs)	ea.	21360-2
CGA 350 (H_2, P_5)	ea.	21360-7
CGA 660 (NO, NO_2, SO_2)	ea.	21360-12

For other CGA fittings, please contact your local Restek representative.

Outlet pressure: 0 to 100 psig
Outlet gauge: 30" – 0 to 200 psig
Inlet gauge: 0 to 4,000 psig
Outlet assembly: diaphragm valve, 1/4" tube fitting

Automatic Switchover System for Corrosive Gases (Silcosteel®-Treated)

Description	qty.	cat.#
CGA 320 (CO_2, CH_3F)	ea.	22364320
CGA 330 (H_2S and other reduced sulfurs)	ea.	22364330
CGA 350 (H_2, P_5)	ea.	22364350

Outlet pressure: 0 to 100 psig
Outlet gauge: 30" – 0 to 200 psig
Inlet gauge: 0 to 4,000 psig
Outlet assembly: diaphragm valve, 1/4" tube fitting

Overview of Restek Ultra-High Purity (UHP) Gas Regulators

- Regulators feature metal-to-metal seals throughout for long-term leak-tightness.
- Metal diaphragm outlet valve ensures gas purity.
- Each regulator is helium leak-test-certifiable to $1x10^{-8}$ scc/sec.
- Temperature range: -40 °C to 60 °C.

Ultra-High Purity (UHP) Brass Body Gas Regulators

UHP brass regulators are the best choice when using ultra-high purity carrier gas for sensitive GC applications using MS, PID, or ECD detection methods. They feature reduced internal dead volume relative to stainless steel bodies. The metal valve diaphragm ensures leak-free shutoff. Oxidation-resistant chrome plating maintains a like-new appearance.

Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

Dual-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Most stable outlet pressure control.
- Secondary pressure regulation not needed.
- Most widely used regulator.
- Less internal volume than stainless steel gas regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	21667
CGA 350 (H_2, P_5)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	21668
CGA 590 (Air)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	21669
DIN 477 #1 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22369
DIN 477 #6 (He, Ar)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22368
DIN 477 #9 (Air)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22370
DIN 477 #10 (N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22371
BS 341 #3 (He, Ar, Air, N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22136
BS 341 #4 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22137

NEW!

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

Single-Stage Ultra-High Purity Chrome-Plated Brass Gas Regulators

- Oxidation-resistant, chrome-plated.
- Use when there is secondary pressure regulation downstream.
- Identical gas purity protection as with dual-stage gas regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20646
CGA 350 (H_2, P_5)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20647
CGA 590 (Air)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20648
DIN 477 #1 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22373
DIN 477 #6 (He, Ar)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22372
DIN 477 #9 (Air)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22374
DIN 477 #10 (N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22375
BS 341 #3 (He, Ar, Air, N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22138
BS 341 #4 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22139

NEW!

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

Inlet connections: 1/4" FPT
Outlet assembly: 1/4" FPT port

Ultra-High Purity Chrome-Plated Brass Line Gas Regulator

- Oxidation-resistant, chrome-plated.
- Use where you need to reduce the line pressure by 20 psig (138 kPa) or more.
- Same purity protection as high-pressure cylinder regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
1/4" female NPT ports*	0-50 psig (0-345 kPa)	30" - 0 to 100 psig (0-689 kPa)	ea.	21666
1/4" female NPT ports*	0-100 psig (0-689 kPa)	30" - 0 to 200 psig (0-1,379 kPa)	ea.	22452

*Order appropriate male connector, pipe-to-tube fittings.

Ultra-High Purity (UHP) Stainless Steel Body Gas Regulators

UHP stainless steel regulators are the standard for ultra-high-purity and corrosion-resistant pressure regulation. They are more easily purged of atmospheric components, compared to brass gas regulators, making them ideal for the most demanding applications. Stainless steel is especially useful in atmospheres of dry corrosive gases such as hydrogen.

Dual-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Most stable outlet pressure control.
- Secondary pressure regulation not needed.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20662
CGA 350 (H_2, P_5)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20663
CGA 590 (Air)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20664
DIN 477 #1 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22377
DIN 477 #6 (He, Ar)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22376
DIN 477 #9 (Air)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22378
DIN 477 #10 (N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22379
BS 341 #3 (He, Ar, Air, N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22140
BS 341 #4 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22141

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

NEW!

Single-Stage Ultra-High Purity Stainless Steel Gas Regulators

- Use when there is secondary pressure regulation downstream.
- Identical gas purity protection as with dual-stage gas regulators.

Fitting	Outlet Pressure	Outlet Gauge	qty.	cat.#
CGA 580 (N_2, He, Ar)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20665
CGA 350 (H_2, P_5)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20666
CGA 590 (Air)	0 to 100 psig (0–689 kPa)	30" – 0 to 200 psig (0–1,379 kPa)	ea.	20667
DIN 477 #1 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22380
DIN 477 #6 (He, Ar)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22445
DIN 477 #9 (Air)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22446
DIN 477 #10 (N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22447
BS 341 #3 (He, Ar, Air, N_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22142
BS 341 #4 (H_2)	0 to 7 bar (0–100 psig)	30" – 0 to 14 bar (0–200 psig)	ea.	22143

Note: CGA fittings are for U.S. use; DIN fittings are for European use; BS fittings are for use in the UK.

Inlet gauge: 0 to 4,000 psig (0–27,579 kPa)
Outlet assembly: diaphragm valve, 1/4" tube fitting

NEW!

ordering note

International Fittings

All gas regulators are available with the following BS (British Standard) and DIN (German Industrial Standards Organization) connections. Please contact your local Restek representative for more information.

BS 341 #01	BS 341 #08	BS 341 #15	DIN 477 #06	DIN 477 #10	DIN 477 #14
BS 341 #02	BS 341 #10	DIN 477 #01	DIN 477 #07	DIN 477 #11	DIN 477 #15
BS 341 #03	BS 341 #13	DIN 477 #03	DIN 477 #08	DIN 477 #12	
BS 341 #04	BS 341 #14	DIN 477 #05	DIN 477 #09	DIN 477 #13	

21341

Flexible Stainless Steel Hoses

Description	Length	Fittings	qty.	cat. #
Flexible Stainless Steel Hose	36"	1/4" Female NPT	ea.	21339
Flexible Stainless Steel Hose	18"	1/4" Female NPT	ea.	21340

21334

Flammable Gas Flash Arrestor—Factory Mutual Approved*

- Gas flow shuts off in the event of a flashback.
- Flame extinguished—flame front prevented from reaching the gas supply.
- No gas flow restriction under normal operating conditions.

Description	Fittings	qty.	cat.#
Flammable Gas Flash Arrestor, Brass Body	1/4" NPTF	ea.	21334

*Approved for brass body servicing hydrogen, acetylene, propane, or natural gas only.

21336

CGA Fittings

CGA-specified nuts and nipples with internal frit, 1/4-inch NPT nickel-plated brass.

Description	qty.	cat.#
CGA 580 Fitting (N_2, He, Ar)	ea.	21336
CGA 350 Fitting (H_2, P_5)	ea.	21337
CGA 590 Fitting (Air)	ea.	21338

23134

23179

Swagelok® Male Connector, Pipe-to-Tube Fittings

Fitting Type	Size (inches)	Similar to Swagelok	Brass qty.	Brass cat.#	Stainless Steel qty.	Stainless Steel cat.#
Male Connector	1/4" to 1/4" NPT	400-1-4	10-pk.	23134	2-pk.	23184
Male Connector	1/8" to 1/4" NPT	200-1-4	10-pk.	23136	2-pk.	23186
Tube End Reducer	1/4" to 1/8"	200-R-4	5-pk.	23129	2-pk.	23179

Automatic Switchover System for Noncorrosive Gases (Critical Purity)

High-purity automatic switchover systems provide a continuous supply of high purity gas to the laboratory, process, or instrument to allow you to replace a depleted gas source without interruption in the gas supply. Continuous gas supply is achieved by setting the two regulators at slightly different pressures and discharging one side of the system at a time. These models include flexible, all-stainless-steel pigtails with armor casing. The CGA connection on each pigtail has a check valve in the gland to prevent contamination and minimize purging requirements.


20668580

Switching pressure:	200 psig/170 psig (1,379/1,172 kPa)
Inlet connections:	flexible SS pigtails (36")
Line regulator:	0 to 100 psig (0-689 kPa)

Brass Automatic Switchover System with Line Regulator	qty.	cat.#
CGA 580 (N_2, He, Ar)	ea.	20668580
CGA 350 (H_2, P_5)	ea.	20668350
CGA 590 (Air)	ea.	20668590
Stainless Steel Automatic Switchover System with Line Regulator	**qty.**	**cat.#**
CGA 580 (N_2, He, Ar)	ea.	21593580

Protocol Station

The protocol station is designed for convenient wall mounting of high-purity gas regulators. Wall mounting provides ease of use, prevents gas regulator damage, and improves safety. Either chrome-plated brass or 316 stainless steel option is complete with a 3-foot, flexible, all-stainless-steel pigtail with armor casing. The CGA connection on the pigtail has an integral check valve in the gland to prevent contamination during cylinder changeout.


21347

Chrome-Plated Brass Protocol Station*	qty.	cat.#
CGA 580 (N_2, He, Ar)	ea.	21347
CGA 350 (H_2, P_5)	ea.	21348
CGA 590 (Air)	ea.	21349
Stainless Steel Protocol Station*	**qty.**	**cat.#**
CGA 580 (N_2, He, Ar)	ea.	21327

*Pressure regulator not included. Order separately.


21321

Cylinder Valve Wrench

This specially designed wrench enables easy opening of cylinder valves that are fitted with a hand wheel. It is also suitable for removing difficult cylinder caps.

Description	qty.	cat.#
Cylinder Valve Wrench	ea.	21321


21322

Universal Cylinder Wrench

Use this versatile wrench for tightening gauges and gas regulator CGA fittings to cylinder outlets and pipe thread connections.

Description	qty.	cat.#
Universal Cylinder Wrench	ea.	21322


21333
23400
23401
23402

Cylinder Holders, Wall Mounted

Prevent serious injuries! These holders are designed to prevent free-standing gas cylinders from tipping over and injuring personnel. The cast aluminum holder can be secured to a wall or the side of a work bench. Each mount will secure a cylinder 4-15 inches in diameter.

Description	Size	qty.	cat.#
Cylinder Holder, Wall Mounted	Single	ea.	21333
Cylinder Holder, Wall Mounted	Double	ea.	23400
Cylinder Holder, Wall Mounted	Triple	ea.	23401
Cylinder Holder, Wall Mounted	Four	ea.	23402


20635

Backpressure Gas Regulator

Capillary GC inlet systems have backpressure regulators to maintain a constant upstream pressure and rapidly respond to catastrophic leaks. The 0–60 psig (0-414 kPa) operating range is sufficient to operate a 105 m, 0.25 mm ID column at its optimum flow rate.

Description	qty.	cat.#
Backpressure Gas Regulator	ea.	20635


20610

MINICYL Regulator

This compact general purpose regulator has many laboratory applications including air-drying glassware, sparging or evaporating solutions, and controlling pneumatic valves. It is constructed of lightweight aluminum with an elastomer diaphragm. Includes a 0–60 psig (0-414 kPa) gauge and either 1/8- or 1/4-inch tube fittings.

Description	Fittings	qty.	cat.#
MINICYL Regulator	1/8" Fittings	ea.	20610
MINICYL Regulator	1/4" Fittings	ea.	20611

Swagelok® Fitting Kits

Save more than 40% by purchasing a Restek Swagelok® fittings kit compared to paying full price for the individual parts!

- Includes the most common assortment of 1/8" and 1/4" brass or stainless steel fittings.
- Parts list makes reordering easy.
- Parts come in sturdy toolbox for easy and convenient storage.

40% savings

Swagelok® Fitting Kit (Brass)

Swagelok #	Description (qty included in kit)
B-202-1	1/8" brass nut (20)
B-402-1	1/4" brass nut (20)
B-203-1	1/8" brass front ferrule (20)
B-403-1	1/4" brass front ferrule (20)
B-204-1	1/8" brass back ferrule (20)
B-404-1	1/4" brass back ferrule (20)
B-200-C	1/8" brass cap (6)
B-400-C	1/4" brass cap (6)
B-200-P	1/8" brass plug (6)
B-400-P	1/4" brass plug (6)
B-200-6	1/8" brass union (2)
B-400-6	1/4" brass union (2)
B-400-6-2	1/4" to 1/8" brass reducing union (2)
B-200-3	1/8" brass tee (2)
B-400-3	1/4" brass tee (2)
B-400-R-2	1/8" to 1/4" brass tube end reducer (2)
B-200-R-4	1/4" to 1/8" brass tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#
Swagelok Fitting Kit, Brass	kit	23141

Swagelok® Fitting Kit (Stainless Steel)

Swagelok #	Description (qty included in kit)
SS-202-1	1/8" SS nut (20)
SS-402-1	1/4" SS nut (20)
SS-203-1	1/8" SS front ferrule (20)
SS-403-1	1/4" SS front ferrule (20)
SS-204-1	1/8" SS back ferrule (20)
SS-404-1	1/4" SS back ferrule (20)
SS-200-C	1/8" SS cap (6)
SS-400-C	1/4" SS cap (6)
SS-200-P	1/8" SS plug (6)
SS-400-P	1/4" SS plug (6)
SS-200-6	1/8" SS union (2)
SS-400-6	1/4" SS union (2)
SS-400-6-2	1/4" to 1/8" SS reducing union (2)
SS-200-3	1/8" SS tee (2)
SS-400-3	1/4" SS tee (2)
SS-400-R-2	1/8" to 1/4" SS tube end reducer (2)
SS-200-R-4	1/4" to 1/8" SS tube end reducer (2)
MS-IG-200	1/8" inspection gauge (1)
MS-IG-400	1/4" inspection gauge (1)

Description	qty.	cat.#
Swagelok Fitting Kit, Stainless Steel	kit	23197


nut


front ferrule


back ferrule


nut & ferrule set


plug


union


reducing union


tee


cross


tube end reducer


port connector


male connector


female connector


male quick coupling


female quick coupling

Swagelok® Fittings (Brass & Stainless Steel)

Restek is pleased to offer one of the premier lines of fittings available for chromatographers in the market today. We can supply the entire line of Swagelok® fittings. If you don't see the exact product you're looking for, please call us or contact your Restek representative for a quote.

			Brass		316 Grade Stainless Steel	
Fitting Type	**Size**	**Swagelok #**	**qty.**	**cat.#**	**qty.**	**cat.#**
Nut	1/16"	102-1	20-pk.	23100	5-pk.	23150
	1/8"	202-1	40-pk.	23101	10-pk.	23151
	1/4"	402-1	40-pk.	23102	10-pk.	23152
Front Ferrule	1/16"	103-1	20-pk.	23103	10-pk.	23153
	1/8"	203-1	40-pk.	23104	20-pk.	23154
	1/4"	403-1	40-pk.	23105	20-pk.	23155
Back Ferrule	1/16"	104-1	20-pk.	23106	10-pk.	23156
	1/8"	204-1	40-pk.	23107	20-pk.	23157
	1/4"	404-1	40-pk.	23108	20-pk.	23158
Nut & Ferrule Set	1/16"	—	10-pk.	23109	2-pk.	23159
	1/8"	—	20-pk.	23110	5-pk.	23160
	1/4"	—	20-pk.	23111	5-pk.	23161
Plug	1/16"	100-P	5-pk.	23112	2-pk.	23162
	1/8"	200-P	10-pk.	23113	4-pk.	23163
	1/4"	400-P	10-pk.	23114	4-pk.	23164
Union	1/16"	100-6	3-pk.	23115	ea.	23165
	1/8"	200-6	5-pk.	23116	2-pk.	23166
	1/4"	400-6	5-pk.	23117	2-pk.	23167
Reducing Union	1/8" to 1/16"	200-6-1	5-pk.	23118	ea.	23168
	1/4" to 1/16"	400-6-1	5-pk.	23119	2-pk.	23169
	1/4" to 1/8"	400-6-2	5-pk.	23120	2-pk.	23170
Tee	1/16"	100-3	2-pk.	23121	ea.	23171
	1/8"	200-3	2-pk.	23122	ea.	23172
	1/4"	400-3	2-pk.	23123	ea.	23173
Cross	1/8"	200-4	2-pk.	23124	ea.	23174
	1/4"	400-4	2-pk.	23125	ea.	23175
Tube End Reducer	1/8" to 1/16"	100-R-2	5-pk.	23126	2-pk.	23176
	1/4" to 1/16"	100-R-4	5-pk.	23127	2-pk.	23177
	1/8" to 1/4"	400-R-2	5-pk.	23128	2-pk.	23178
	1/4" to 1/8"	200-R-4	5-pk.	23129	2-pk.	23179
Port Connector	1/8"	201-PC	5-pk.	23130	2-pk.	23180
	1/4"	401-PC	10-pk.	23131	2-pk.	23181
	1/8" to 1/4"	401-PC-2	5-pk.	23132	2-pk.	23182
Male Connector	1/8" to 1/8" NPT	200-1-2	10-pk.	23133	2-pk.	23183
	1/4" to 1/4" NPT	400-1-4	10-pk.	23134	2-pk.	23184
	1/16" to 1/8" NPT	100-1-2	5-pk.	23135	2-pk.	23185
	1/8" to 1/4" NPT	200-1-4	10-pk.	23136	2-pk.	23186
	1/4" to 1/8" NPT	400-1-2	10-pk.	23137	2-pk.	23187
Female Connector	1/8" to 1/8" NPT	200-7-2	5-pk.	23138	2-pk.	23188
	1/4" to 1/4" NPT	400-7-4	5-pk.	23139	2-pk.	23189
	1/4" to 1/8" NPT	400-7-2	5-pk.	23140	2-pk.	23190
Male & Female Quick Couplings	1/8" male*	QC4D-200	—	—	ea.	23191
	1/8" male	QC4S-200	—	—	ea.	23192
	1/8" female*	QC4B-200	—	—	ea.	23193
	1/4" male*	QC4D-400	—	—	ea.	23194
	1/4" male	QC4S-400	—	—	ea.	23195
	1/4" female*	QC4B-400	—	—	ea.	23196

*Includes self-sealing shutoff valve.

Swagelok® Fittings (Siltek®/Sulfinert® & Silcosteel®-CR Treated)

- Full line of treated 1/16", 1/8", and 1/4" fittings.
- Silcosteel®-CR treatment enhances corrosion resistance by 10x or more.
- For custom treatment on any Swagelok® fitting or other system parts not listed here, call us or contact your Restek representative.

			Siltek/Sulfinert Treated		Silcosteel-CR Treated	
Fitting Type	**Size**	**Swagelok #**	**qty.**	**cat.#**	**qty.**	**cat.#**
Union	1/16"	SS-100-6	ea.	22540	ea.	22575
	1/8"	SS-200-6	ea.	22541	ea.	22576
	1/4"	SS-400-6	ea.	22542	ea.	22577
	3/8"	SS-600-6	ea.	22909	ea.	22904
Tee	1/16"	SS-100-3	ea.	22543	ea.	22578
	1/8"	SS-200-3	ea.	22544	ea.	22579
	1/4"	SS-400-3	ea.	22545	ea.	22580
	3/8"	SS-600-3	ea.	22910	ea.	22905
Reducing Union	1/8" to 1/16"	SS-200-6-1	ea.	22546	ea.	22581
	1/4" to 1/16"	SS-400-6-1	ea.	22547	ea.	22582
	1/4" to 1/8"	SS-400-6-2	ea.	22548	ea.	22583
	3/8" to 1/4"	SS-600-6-4	ea.	22911	ea.	22906
Elbow	1/8"	SS-200-9	ea.	22549	ea.	22584
	1/4"	SS-400-9	ea.	22550	ea.	22585
Plug	1/8"	SS-200-P	ea.	22573	ea.	22620
	1/4"	SS-400-P	ea.	22574	ea.	22597
Cross	1/8"	SS-200-4	ea.	22551	ea.	22586
	1/4"	SS-400-4	ea.	22552	ea.	22587
Tube End Reducer	1/8" tube to 1/16"	SS-100-R-2	ea.	22553	ea.	22588
	1/4" tube to 1/16"	SS-100-R-4	ea.	22554	ea.	22589
	1/8" tube to 1/4"	SS-400-R-2	ea.	22555	ea.	22590
	1/4" tube to 1/8"	SS-200-R-4	ea.	22556	ea.	22591
Port Connector	1/8"	SS-201-PC	ea.	22557	ea.	22592
	1/4"	SS-401-PC	ea.	22558	ea.	22593
	1/8" tube to 1/4"	SS-401-PC-2	ea.	22559	ea.	22594
Male Connector	1/8" to 1/8" NPT	SS-200-1-2	ea.	22561	ea.	22595
	1/4" to 1/4" NPT	SS-400-1-4	ea.	22562	ea.	22596
	1/16" to 1/8" NPT	SS-100-1-2	ea.	22563	ea.	22610
	1/8" to 1/4" NPT	SS-200-1-4	ea.	22564	ea.	22611
	1/4" to 1/8" NPT	SS-400-1-2	ea.	22565	ea.	22612
	3/8" to 3/8" NPT	SS-600-1-6	ea.	22912	ea.	22907
Female Connector	1/8" to 1/8" NPT	SS-200-7-2	ea.	22566	ea.	22613
	1/4" to 1/4" NPT	SS-400-7-4	ea.	22567	ea.	22614
	1/4" to 1/8" NPT	SS-400-7-2	ea.	22568	ea.	22615
	1/8" to 1/4" NPT	SS-200-7-4	ea.	22569	ea.	22616
Bulkhead Union	1/8"	SS-200-61	ea.	22570	ea.	22617
	1/4"	SS-400-61	ea.	22571	ea.	22618


union


tee


reducing union


elbow

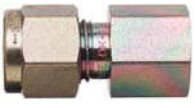

plug


cross


tube end reducer


port connector


male connector


female connector


bulkhead union

Custom Coatings

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.

For more information on our custom coatings, see page 290.


nut


front ferrule


back ferrule


nut & ferrule set


plug


union


reducing union


tee


cross


tube end reducer


port connector


male connector


female connector


male & female quick couplings

Parker® Fittings (Brass & Stainless Steel)

Parker's (A-Lok®) two-piece ferrules and NPT fittings are ideal for installing new equipment, modifying existing instrumentation, or replacing worn connections. Restek offers both brass and stainless steel fittings. If there is a particular Parker® fitting that you are looking for and it is not listed here, please contact us to inquire about availability.

			Brass		316 Grade Stainless Steel	
Fitting Type	**Size**	**Parker #**	**qty.**	**cat.#**	**qty.**	**cat.#**
Nut	1/16"	1 Nu 1	20-pk.	21800	5-pk.	21900
	1/8"	2 Nu 2	40-pk.	21801	10-pk.	21901
	1/4"	4 Nu 4	40-pk.	21802	10-pk.	21902
Front Ferrule	1/16"	1 FF 1	20-pk.	21803	10-pk.	21903
	1/8"	2 FF 2	40-pk.	21804	20-pk.	21904
	1/4"	4 FF 4	40-pk.	21805	20-pk.	21905
Back Ferrule	1/16"	1 BF 1	20-pk.	21806	10-pk.	21906
	1/8"	2 BF 2	40-pk.	21807	20-pk.	21907
	1/4"	4 BF 4	40-pk.	21808	20-pk.	21908
Nut & Ferrule Set	1/16"	—	10-pk.	21809	2-pk.	21909
	1/8"	—	20-pk.	21810	5-pk.	21910
	1/4"	—	20-pk.	21811	5-pk.	21911
Plug	1/16"	1 BLP 1	5-pk.	21815	2-pk.	21915
	1/8"	2 BLP 2	10-pk.	21816	4-pk.	21916
	1/4"	4 BLP 4	10-pk.	21817	4-pk.	21917
Union	1/16"	1 SC 1	3-pk.	21818	ea.	21918
	1/8"	2 SC 2	5-pk.	21819	2-pk.	21919
	1/4"	4 SC 4	5-pk.	21820	2-pk.	21920
Reducing Union	1/8" to 1/16"	2 RU 1	5-pk.	21823	ea.	21923
	1/4" to 1/16"	4 RU 1	5-pk.	21824	2-pk.	21924
	1/4" to 1/8"	4 RU 2	5-pk.	21825	2-pk.	21925
Tee	1/16"	1 ET 1	2-pk.	21826	ea.	21926
	1/8"	2 ET 2	2-pk.	21827	ea.	21927
	1/4"	4 ET 4	2-pk.	21828	ea.	21928
Cross	1/8"	2 ECR 2	2-pk.	21829	ea.	21929
	1/4"	4 ECR 4	2-pk.	21830	ea.	21930
Tube End Reducer	1/8" tube to 1/16"	2 TUR 1	5-pk.	21831	2-pk.	21931
	1/4" tube to 1/16"	4 TUR 1	5-pk.	21832	2-pk.	21932
	1/8" tube to 1/4"	2 TUR 4	5-pk.	21833	2-pk.	21933
	1/4" tube to 1/8"	4 TUR 2	5-pk.	21834	2-pk.	21934
Port Connector	1/8"	2 PC 2	5-pk.	21835	2-pk.	21935
	1/4"	4 PC 4	10-pk.	21836	2-pk.	21936
	1/8" tube to 1/4"	2 PC 4	5-pk.	21837	2-pk.	21937
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	10-pk.	21841	2-pk.	21941
	1/4" to 1/4" NPT	4 MSC 4N	10-pk.	21842	2-pk.	21942
	1/16" to 1/8" NPT	1 MSC 2N	5-pk.	21843	2-pk.	21943
	1/8" to 1/4" NPT	2 MSC 4N	10-pk.	21844	2-pk.	21944
	1/4" to 1/8" NPT	4 MSC 2N	10-pk.	21845	2-pk.	21945
Female Connector	1/8" to 1/8" NPT	2 FSC 2N	5-pk.	21846	2-pk.	21946
	1/4" to 1/4" NPT	4 FSC 4N	5-pk.	21847	2-pk.	21947
	1/4" to 1/8" NPT	4 FSC 2N	5-pk.	21848	2-pk.	21948
Male & Female Quick Couplings	1/8" male*	2A-Q4VN	—	—	ea.	21957
	1/8" male	2A-Q4P	—	—	ea.	21958
	1/8" female*	2A-Q4CN	—	—	ea.	21959
	1/4" male*	4A-Q4VN	—	—	ea.	21960
	1/4" male	4A-Q4P	—	—	ea.	21961
	1/4" female*	4A-Q4CN	—	—	ea.	21962

*Includes self-sealing shut-off valve.

Parker® Fittings (Siltek®/Sulfinert® Treated & Silcosteel®-CR Treated)

A broad line of 1/16", 1/8" and 1/4" fittings are available with Siltek®/Sulfinert® or Silcosteel®-CR treatment. Because of expanding applications for these coatings, we have received many requests for a broader product offering. If you do not see everything you need, contact us for information on custom coating services.

			Siltek/Sulfinert Treated		Silcosteel-CR Treated	
Fitting Type	**Size**	**Parker #**	**qty.**	**cat.#**	**qty.**	**cat.#**
Union	1/16"	1 SC 1	ea.	22520	ea.	22863
	1/8"	2 SC 2	ea.	22521	ea.	22864
	1/4"	4 SC 4	ea.	22522	ea.	22865
Tee	1/16"	1 ET 1	ea.	22526	ea.	22866
	1/8"	2 ET 2	ea.	22527	ea.	22867
	1/4"	4 ET 4	ea.	22528	ea.	22868
Reducing Union	1/8" to 1/16"	2 RU 1	ea.	22523	ea.	22869
	1/4" to 1/16"	4 RU 1	ea.	22524	ea.	22870
	1/4" to 1/8"	4 RU 2	ea.	22525	ea.	22871
Elbow	1/8"	2 EE 2	ea.	22530	ea.	22875
	1/4"	4 EE 4	ea.	22531	ea.	22876
Plug	1/8"	2 BLP 2	ea.	21540	ea.	22878
	1/4"	4 BLP 4	ea.	21541	ea.	22879
Cross	1/8"	2 ECR 2	ea.	21542	ea.	22872
	1/4"	4 ECR 4	ea.	21543	ea.	22873
Tube End Reducer	1/8" tube to 1/16"	2 TUR 1	ea.	21544	ea.	22880
	1/4" tube to 1/16"	4 TUR 1	ea.	21545	ea.	22881
	1/8" tube to 1/4"	2 TUR 4	ea.	21546	ea.	22882
	1/4" tube to 1/8"	4 TUR 2	ea.	21547	ea.	22883
Port Connector	1/8"	2 PC 2	ea.	21548	ea.	22884
	1/4"	4 PC 4	ea.	21549	ea.	22885
	1/8" tube to 1/4"	2 PC 4	ea.	21550	ea.	22886
Male Connector	1/8" to 1/8" NPT	2 MSC 2N	ea.	21551	ea.	22887
	1/4" to 1/4" NPT	4 MSC 4N	ea.	21552	—	—
	1/16" to 1/8" NPT	1 MSC 2N	ea.	21553	ea.	22889
	1/8" to 1/4" NPT	2 MSC 4N	ea.	21554	ea.	22890
	1/4" to 1/8" NPT	4 MSC 2N	ea.	21555	ea.	22891
Female Connector	1/8" to 1/8" NPT	2 FSC 2N	ea.	21556	ea.	22892
	1/4" to 1/4" NPT	4 FSC 4N	ea.	21557	ea.	22893
	1/4" to 1/8" NPT	4 FSC 2N	ea.	21558	ea.	22894
	1/8" to 1/4" NPT	2 FSC 4N	ea.	21559	—	—
Plug Valve, 2-Way	1/8"	2A PR4 VT SS	ea.	21586	—	—
	1/4"	4A PR4 VT SS	ea.	21587	—	—
Ball Valve, 2-Way	1/8"	2A B2LJ2 SSP	ea.	21588	—	—
	1/4"	4A B2LJ2 SSP	ea.	21589	—	—

Please note: Nuts and ferrules are not treated unless requested (custom parts). Nuts and ferrules normally are not in contact with sample pathway, and thus do not require coating.

Ball and plug valves are also available in brass and stainless steel. See **page 294**.


union


tee


reducing union


elbow


plug


cross


tube end reducer


port connector


male connector


female connector

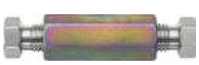

plug valve, 2-way


ball valve, 2-way

Valco® Fittings (Siltek®/Sulfinert® Treated)

		Siltek/Sulfinert Treated	
Fitting Type	**Size**	**qty.**	**cat.#**
Zero Dead Volume Tee	1/16"	ea.	22534
	1/8"	ea.	22535
Zero Dead Volume Union	1/16"	ea.	22532
	1/8"	ea.	22533


zero dead volume tee


zero dead volume union

Tubing and Available Coatings

Restek sets the standard in tubing for analytical and process applications. Complete your system with precleaned or treated tubing and treated fittings and valves for an inert, corrosion-resistant pathway.

Available tubing coatings include:

- **Siltek®**—The ultimate passivation of treated surfaces from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Silcosteel®-CR**—A corrosion resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.

Frequently Asked Questions

1. Can treated tubing be bent?
Treated tubing can be bent into curves with a bend radius greater than 1 inch for 1/16-inch OD tubing, 2 inches for 1/8-inch OD tubing, or 4 inches for 1/4-inch OD tubing. The treatment layer will remain intact as long as the tubing isn't stretched dramatically. If tight bends are necessary, use a treated elbow union or bend untreated tubing and send it to Restek for custom treatment.

2. Can compression fittings be used without crushing the treatment layer?
Yes. The layer is thin and permeates the surface. It compresses with minimal damage.

3. Is welding possible after treatment?
Yes. The coating does not interfere with the welding of two coated components. The coating is lost at the weld and in the heat affected zones approximately 2 to 5 mm on either side of the weld.

4. Is any additional chemical deactivation necessary?
A Sulfinert® or Silcosteel® layer leaves few exposed active sites, so there usually is no need for additional treatment. Chemical deactivation is useful in chromatographic applications in which water will be vaporized on the Silcosteel®-treated surface, but is not necessary for Sulfinert®-treated surfaces. Parts used in high-temperature applications (>400 °C) cannot be chemically deactivated.

5. What are the temperature constraints of these surface treatments?
On stainless steel, a Silcosteel® layer is stable to 600 °C. Parts treated with a secondary polymeric layer are limited to temperatures of 400 °C in inert atmospheres and 250 °C when oxygen is present, the temperature maximums for the polymer. Temperatures above 600 °C can be used under certain conditions—please contact us for information.

6. Why use Sulfinert® or Silcosteel® treatment instead of PTFE coating?
Three reasons: 1) Sulfinert® and Silcosteel® layers are nonpolymeric, so they do not exhibit the problems associated with gas permeability. 2) PTFE coating often flakes off the surface, while the Sulfinert® or Silcosteel® layer is tightly integrated into the substrate lattice. 3) PTFE coating is limited to 280 °C, while Silcosteel®-treated stainless steel tubing and fittings can be used to 600 °C.

7. Why use Siltek®/Sulfinert®-treated tubing for transfer lines?
Siltek®/Sulfinert®-treated stainless steel tubing offers all of the advantages of glass or fused silica tubing for the transfer of active compounds (e.g., sulfurs), but is far more durable and flexible.

8. Is treated tubing similar to glass-lined tubing (GLT)?
No. Sulfinert® or Silcosteel®-treated tubing is flexible and can be bent without heating. Also, the Sulfinert® or Silcosteel® layer is highly inert, unlike impure glass.

9. How can I clean the surface of a treated part after use?
Most often, a mild organic solvent (methylene chloride, methanol, hexane) or water is sufficient. Mild sonication may assist and accelerate the process. Do not use caustic, abrasive, or high pH (pH>8) cleaners, as they will damage or dissolve the layer. Steam cleaning in the presence of oxygen or air could create surface activity, and also should be avoided.

10. What materials should I avoid using with Silcosteel®-treated parts?
The Silcosteel® coating is silicon-based and is prone to attack by hydrofluoric acid or by basic compounds. The surface should not be exposed to media with pH>8.

11. Siltek® and Sulfinert®: What's the Difference?
Siltek® is the name for the patented deposition process. When the Siltek® process was developed, the application that showed the greatest benefit was the storage and transfer of low ppb level active sulfur compounds, such as hydrogen sulfide and mercaptans. Because there was (and continues to be) demand for a reliable surface treatment for this application, the name Sulfinert® is used to describe Siltek®-treated products created specifically for this purpose.

Rinsed and Cleaned 304 Stainless Steel Tubing

Use for providing carrier, fuel, make-up, or auxiliary gases to laboratory instruments.

Tubing Dimensions		Length (per-foot pricing on 26 feet or more)		
		25 Feet	26–100 Feet	>100 Feet*
ID (in.)	OD (in.)	cat.#	cat.#	cat.#
0.01"	1/16"	21500	21501	21502
0.02"	1/16"	21503	21504	21505
0.03"	1/16"	21506	21507	21508
0.04"	1/16"	21509	21510	21511
0.085"	1/8"	21512	21513	21514
0.21"	1/4"	21515	21516	21517

*The availability of long lengths (continuous lengths up to 500 feet) is subject to inventory constraints. Please inquire before ordering.

An extra charge is applied for cutting and/or straightening stainless steel and/or copper tubing, calculated from the total number of pieces produced for each line item

Copper Tubing

NEW!

Use for plumbing GC systems.

ID	OD	Wall	Max Operating Pressure	qty.	cat.#
0.065"	1/8"	0.030"	2,800 psig	50 ft	22628
0.190"	1/4"	0.030"	1,000 psig	50 ft	22629

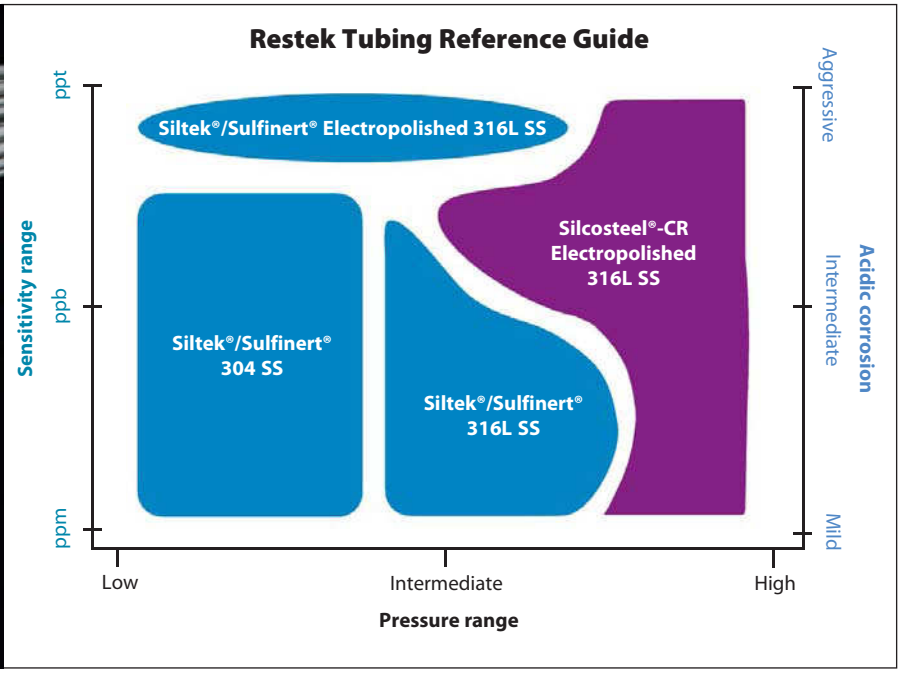
ordering note

Required length in meters x 3.2808 = length in feet.

frequently asked question

Which treated tubing should I use?

This chart will help you determine the tubing best suited to your application with respect to pressure, sensitivity of your analysis, and acidic environment exposure. For more frequently asked questions on treated tubing, see previous page.



did you know?

A smoother internal surface is less adsorptive.

Top: electropolished finish, surface roughness average number: 10-15.

Bottom: conventional finish, surface roughness average number: approx. 23-27.

An extra charge is applied for cutting Siltek®/ Sulfinert® or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item

Minimum Bend Radius for Coated Tubing

OD	Min. Bend Radius
1/16"	1" (2.5 cm)
1/8"	2" (5.1 cm)
1/4"	4" (10.2 cm)
3/8"	6" (15.2 cm)

did you know?

Other lengths and diameters of treated tubing are available on a custom basis.

Call for availability of lengths greater than 1,000 ft

ordering note

Required length in meters x 3.2808 = length in feet.

Treated Seamless Electropolished 316L Grade Stainless Steel Tubing

Our highest performing tubing. Recommended for:

- Demanding/corrosive environments.
- High temperatures.
- Ultimate inertness.

Siltek®/Sulfinert Treated (Coiled)

OD	ID	Wall Thickness	cat.#	5-24 ft	25-99 ft	100-299 ft	>300 ft
1/8" (3.18 mm)	0.085" (2.16 mm)	0.020"	22538				
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	22539				

Silcosteel®-CR Treated (Coiled)

OD	ID	Wall Thickness	cat.#	5-24 ft	25-99 ft	100-299 ft	>300 ft
1/8" (3.18 mm)	0.085" (2.16 mm)	0.020"	22536				
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	22537				

1/8" OD: 5 ft to 95 ft in one continuous coil; 1/4" OD: 5 ft to 300 ft in one continuous coil. Longer lengths will be more than one coil.
Note: required length in meters x 3.2808 = length in feet.

Treated Welded/Drawn 304 Grade Stainless Steel Tubing

Our most popular grade of tubing. Recommended for:

- Chromatography applications.
- Gas delivery systems.
- Lower pressures.
- Inert applications.

Maximum temperature of 450 °C in an inert atmosphere.

Siltek®/Sulfinert® Treated (Coiled)

OD	ID	Wall Thickness	cat.#	5-24 ft	25-199 ft	200-399 ft	>400 ft
0.022" (0.56 mm)	0.011" (0.28 mm)		22500				
0.029" (0.74 mm)	0.021" (0.53 mm)		22501				
1/16" (1.59 mm)	0.010" (0.25 mm)		22502				
1/16" (1.59 mm)	0.020" (0.51 mm)		22503				
1/16" (1.59 mm)	0.030" (0.76 mm)		22504				
1/16" (1.59 mm)	0.040" (1.02 mm)		22505				
1/8" (3.18 mm)	0.085" (2.16 mm)	0.020"	22506				
1/4" (6.35 mm)	0.210" (5.33 mm)	0.020"	22507				

Treated Seamless 316L Grade Stainless Steel Tubing

High durability tubing. Recommended for:

- Inert applications.
- High temperatures.
- High pressures.
- Corrosive environments.
- Zero bleed.

Siltek®/Sulfinert® Treated (Coiled)

OD	ID	Wall Thickness	cat.#	5-24 ft	25-199 ft	200-399 ft	>400 ft
1/8" (3.18 mm)	0.055" (1.40 mm)	0.035"	22508				
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	22509				
3/8" (9.52 mm)	0.277" (7.04 mm)	0.049"	22914				

Silcosteel®-CR Treated (Coiled)

OD	ID	Wall Thickness	cat.#	5-24 ft	25-199 ft	200-399 ft	>400 ft
1/8" (3.18 mm)	0.055" (1.40 mm)	0.035"	22896				
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	22897				
3/8" (9.52 mm)	0.277" (7.04 mm)	0.049"	22915				

1/4" OD: 5 ft to 500 ft in one continuous coil; 3/8" OD: 5 ft to 250 ft in one continuous coil. Longer lengths will be more than one coil.

Treated Straight, 6-Foot Length Stainless Steel Tubing

Individual 6-foot (± 1/2") straight pieces.

In response to customer requests, we offer 6-foot straight lengths of 1/8-, 1/4, and 3/8-inch treated tubing. This tubing can be cut to your exact requirements using a standard tubing cutter.

Silcosteel®-CR Treated, 316L Grade

OD	ID	Wall Thickness	qty.	cat.#
1/8" (3.18 mm)	0.055" (1.40 mm)	0.035"	ea.	22898
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	ea.	22899
3/8" (9.52 mm)	0.277" (7.04 mm)	0.049"	ea.	22900

Siltek®/Sulfinert® Treated, 316L Grade

OD	ID	Wall Thickness	qty.	cat.#
1/8" (3.18 mm)	0.055" (1.40 mm)	0.035"	ea.	22901
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	ea.	22902
3/8" (9.52 mm)	0.277" (7.04 mm)	0.049"	ea.	22903

Siltek®/Sulfinert® treated tubing is recommended for purge & trap and headspace systems.

Treated Hydroguard® Deactivated Stainless Steel Tubing

Hydroguard® deactivation creates a high-density surface that is not readily attacked by aggressive hydrolysis.

Silcosteel® Treated, 304 Grade

OD	ID	Wall Thickness	cat.#	5-24 ft	25-199 ft	200-399 ft	>400 ft
1/16" (1.59 mm)	0.010" (0.25 mm)		22497				
1/16" (1.59 mm)	0.020" (0.51 mm)		22496				
1/16" (1.59 mm)	0.030" (0.76 mm)		22495				
1/16" (1.59 mm)	0.040" (1.02 mm)		22494				
1/8" (3.18 mm)	0.085" (2.16 mm)	0.020"	22493				
1/4" (6.35 mm)	0.210" (5.33 mm)	0.020"	22492				

Silcosteel® Treated, Seamless 316L Grade

OD	ID	Wall Thickness	cat.#	5-24 ft	25-199 ft	200-399 ft	>400 ft
1/8" (3.18 mm)	0.055" (1.40 mm)	0.035"	22491				
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	22490				

Silcosteel® Treated, Electropolished 316L Grade

OD	ID	Wall Thickness	cat.#	5-24 ft	25-99 ft	100-299 ft	>300 ft
1/8" (3.18 mm)	0.085" (2.16 mm)	0.020"	22489				
1/4" (6.35 mm)	0.180" (4.57 mm)	0.035"	22488				

An extra charge is applied for cutting Siltek®/Sulfinert®, Silcosteel®, or Silcosteel®-CR tubing. The charge is calculated from the total number of pieces produced for each line item

Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you from set-up to method development.

For quick answers to commonly asked questions any time, visit www.restek.com/**answers**

Contact us directly:

IN THE U.S.: **Phone: 1-800-356-1688, ext. 4** • Fax: 1-814-353-1568 • e-mail: support@restek.com

OUTSIDE THE U.S.: Contact your Restek representative.

Gas Valves, VCO Fittings

Toggle valve

Ball valve

Plug valve

Shut-Off Gas Valves Swagelok®

Valve Type	1/8" Brass cat.#	ea.	1/4" Brass cat.#	ea.	1/8" Stainless Steel cat.#	ea.	1/4" Stainless Steel cat.#	ea.
Toggle	23142		23143		23198		23199	
Ball	23144		23145		23200		23201	
Plug	23146		23147		23202		23203	

23206

Metering Gas Valves
Swagelok®

Description	qty.	cat.#
1/8" Brass Metering Valve, straight	ea.	23148
1/4" Brass Metering Valve, straight	ea.	23149
1/8" Stainless Steel Metering Valve, straight	ea.	23204
1/4" Stainless Steel Metering Valve, straight	ea.	23205
Vernier Knob for Metering Valve	ea.	23206

23148

Toggle valve

Ball valve

Plug valve

Shut-Off Gas Valves Parker Balston®

Valve Type	1/8" Brass cat.#	ea.	1/4" Brass cat.#	ea.	1/8" Stainless Steel cat.#	ea.	1/4" Stainless Steel cat.#	ea.
Toggle	22188		22189		22190		22191	
Ball	22192		22193		22194		22195	
Plug	22196		22197		22198		22199	

22209

Metering Gas Valves
Parker Balston®

Description	qty.	cat.#
1/8" Nickel-Plated Brass Metering, straight	ea.	22200
1/4" Nickel-Plated Brass Metering, straight	ea.	22201
1/8" Stainless Steel Metering, straight	ea.	22204
1/4" Stainless Steel Metering, straight	ea.	22205
Vernier Knob for Metering Valve	ea.	22209

22200

23207

23209

23214

23212

23213

23210

23211

23215

VCO® O-Ring Face Seal Fittings
(Stainless Steel & Treated) Swagelok®

- Unique design allows easy installation where space is limited.
- Assemblies can be used from high pressure to critical vacuum across a wide range of temperatures.
- Smooth finish on gland face ensures positive seal.
- Sealing is accomplished with a captive O-ring in the body component.

Swagelok® VCO® O-ring face seal fittings are designed for rapid assembly in pipe, tube, and welded systems.

Specifications:

Pressure Ratings	Up to 15,400 psig (1,061 bar)
Temperature Ratings	Up to 400 °F (204 °C)

Description	Material	qty.	cat.#
1/4" VCO to 1/4" Tube Adaptor	Stainless Steel	2-pk.	23207
1/4" VCO to 1/4" Tube Adaptor	Siltek Treated	2-pk.	23209
1/4" VCO to 1/4" Tube Fitting	Stainless Steel	2-pk.	23210
1/4" VCO to 1/4" Tube Fitting	Siltek Treated	ea.	23211
1/4" VCO to 1/8" Tube Fitting	Stainless Steel	2-pk.	23215
1/4" VCO to 1/8" Tube Fitting	Siltek Treated	ea.	23216
1/4" VCO Nut	Stainless Steel	2-pk.	23212
1/4" VCO Nut Blind	Stainless Steel	2-pk.	23213
1/4" VCO Body Blind	Stainless Steel	2-pk.	23214
Replacement O-Ring, 70 Durometer Fluorocarbon FKM, VCO 1/4", Size 010		10-pk.	23208

21325

GC Installation Kit

This kit contains the tubing and fittings needed to add an additional GC to your lab bench. Kit includes: tubing cutter, one 1/8-inch x 1/4-inch reamer, one 1/4-inch x 1/8-inch brass tube end reducer, one 7/16-inch wrench, one 1/2-inch wrench, four 1/8-inch brass tees, ten 1/8-inch brass nuts, ten brass front and back ferrules, and 50 feet (15.2 meters) of our instrument-grade cleaned 1/8-inch copper tubing.

Description	qty.	cat.#
GC Installation Kit	kit	21325

23004

54-Piece Tool Kit

Set comes with screwdrivers, pliers, wrenches, sockets, scissors, clamps, and more. Durable, zippered, notebook-style carrying case for easy transport.

Description	qty.	cat.#
Tool Kit	kit	23004

Plier Set

Includes 6-inch nose/side cutter, 6-inch wire cutter, and 6-inch adjusting pliers.

Description	qty.	cat.#
Plier Set	set	23033

22999

Metric 9-Piece, Ball-Point Hex Key Set

Includes nine metric hex keys (Allen wrenches): 1.5, 2, 2.5, 3, 4, 5, 6, 8, and 10 mm.

Description	qty.	cat.#
Metric 9-Piece, Ball-Point Hex Key Set	set	22999

22998

12-Piece, Ball-Point Hex Key Set

Includes 12 hex keys (Allen wrenches): 0.050", 1/16", 5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4", and 5/16".

Description	qty.	cat.#
12-Piece, Ball-Point Hex Key Set	set	22998

23034

Torx® Screwdriver Set

- Set includes TR-10, TR-15, and TR-20.
- Ideal for performing routine maintenance on Agilent 6890 and 7890 GCs.

Description	qty.	cat.#
Torx Screwdriver Set	set	23034

Torx® is a registered trademark of Textron Inc.

23002

5-in-1 Magnetic Screwdriver

Magnetic power tip holds bits and screws securely.

Description	qty.	cat.#
5-in-1 Magnetic Screwdriver	set	23002

23001

Wrench Set

Includes 4-inch, 6-inch, and 8-inch adjustable wrenches.

Description	qty.	cat.#
Wrench Set	set	23001

20192

1/16-Inch Tubing Cutter

- Produces square, smooth cuts in 1/16-inch tubing.
- Eliminates tubing distortion.
- Cuts hard or soft copper, aluminum, brass, stainless steel, Monel® alloy, or titanium.
- Replaceable cutting wheel.

Description	qty.	cat.#
1/16" Tubing Cutter	ea.	20192
Replacement Cutting Wheels	3-pk.	20185

Ridgid® Tubing Cutter

- Excellent for cutting 1/8- or 1/4-inch metal tubing.*
- Compact size is ideal for tight spaces.
- Replaceable cutting wheel.

23011

Description	qty.	cat.#
Ridgid Tubing Cutter for 1/8" or 1/4" metal tubing	ea.	23011
Replacement Cutting Wheels	2-pk.	23012

*Not for use with stainless steel tubing.

Hi-Duty Tubing Cutter

- Specifically designed to cut 1/8" to 1 1/8" (4 mm to 28 mm) OD tubing.

22356

- Easily cuts stainless steel, Monel® alloy, and other hard-temper materials.
- Unique design makes clean, right-angle cuts and eliminates spiraling.
- Integral reamer folds away for safety and convenience.
- Replacement cutter wheels also available.

Description	qty.	cat.#
Hi-Duty Tubing Cutter	ea.	22356
Replacement Cutting Wheels	2-pk.	22357


20193

1/16-Inch Tubing Cutting Pliers

- Ideal for cutting 1/16-inch tubing.
- Cuts quickly, reducing distortion.
- Cuts clean, eliminating need for deburring.

Description	qty.	cat.#
1/16" Tubing Cutting Pliers	ea.	20193

23029

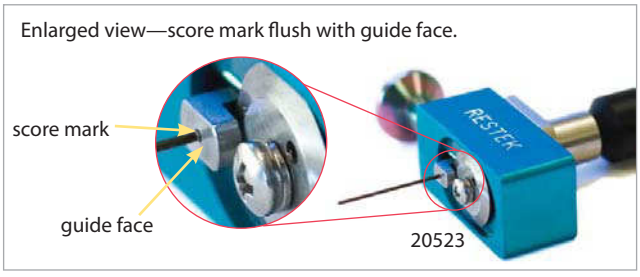
SSI TC-20 Tube Cutting Machine

- Cuts 1/16", 1/8", or 1/4" tubing with inside diameter as small as 0.008".
- Electrically operated bench-top model.
- Handy dressing tool on the swing arm removes burrs and reams tubing.
- Voltage selectable 110–120/220–240 volts, 50–60 Hz.*

Dimensions: 8" x 6 1/4" x 4 1/4" (20.3 x 15.9 x 10.8 cm)
Weight: 11 lbs. (5.0 kg)

Description	qty.	cat.#
SSI Tubing Cutter Machine	ea.	23029
SSI Replacement Cutting Wheels	3-pk.	23030

*Unit shipped set for 110–120 operating voltage. Switch to 220–240 volts by using alternate fuse and power cord (included).



20523

Restek Tubing Scorer for MXT® Columns

- Makes a perfect cut every time.
- Easy to use.
- Leaves column entrance perfectly round.
- Ideal for creating a leak-free seal with connectors and valves.

Metal MXT® columns are easy to cut. Scoring wafers can be used, but may leave the column end irregularly shaped. The Restek tubing scorer is designed to make a perfect cut every time, leaving the column entrance perfectly round.

Description	qty.	cat.#
Restek Tubing Scorer for MXT Columns (0.25-0.53 mm ID & 0.5-0.8 mm OD)	ea.	20523
Replacement Scoring Wheel	ea.	20522

20188

Tubing Burring & Reaming Tool

Removes burrs and reams tubing.

Description	Size	qty.	cat.#
Tubing Dressing Tool	1/16"	ea.	20188
Replacement Insert	for 1/16" Tubing Dressing Tool	ea.	20189
Tubing Dressing Tool	1/8"	ea.	20190
Replacement Insert	for 1/8" Tubing Dressing Tool	ea.	20191

20134

Tubing Reamer

- Removes burrs from stainless steel tubing.
- For 1/4- or 1/8-inch tubing.
- Nonslip safety design.

Description	qty.	cat.#
Tubing Reamer	ea.	20134

23009

Tubing Bender

- Bends 1/8-inch, 3/16-inch, or 1/4-inch tubing.
- Assists in making accurate left-hand, right-hand, or offset bends.

Description	qty.	cat.#
Tubing Bender	ea.	23009

ResTape PTFE Tape

- For threaded connections in a wide range of plumbing materials.
- Each roll is 1/2" x 260".
- Maximum temperature: 260 °C.

Description	Color	Uses	qty.	cat.#
ResTape	Green PTFE	oxygen service*	ea.	22485
ResTape	Yellow PTFE	general gas service**	ea.	22486
ResTape	Grey PTFE	stainless steel fittings***	ea.	22487

*Compatible with gaseous or liquid oxygen, and with many other gases and liquids.
**Compatible with a broad range of gases and liquids.
***Anti-galling. Also compatible with many other metals and polymers.

22627

Flexible Inspection Light

- Inspect inside surfaces of sample cylinders or other chambers.
- 14" reach.
- 100,000-hour LED life.

Description	qty.	cat.#
Flexible Inspection Light	ea.	22627

22622

Swaging Tool

- Preswage compression fittings for easy installation.
- Ideal for installations in tight areas.
- For Swagelok® fittings only.

Description	qty.	cat.#
Swaging Tool	ea.	22622

22623

Tee Wrench

- Hold 1/4" or 6 mm tee or cross fittings secure in multiple orientations during installation.
- Fits easily in tool box, pouch, or belt.
- Cushioned vinyl grip with generous gripping area.
- For Swagelok® fittings only.

Description	qty.	cat.#
Tee Wrench	ea.	22623

22624

Gap Inspection Gauge

- Confirm that fittings are sufficiently tightened.
- For use with 1/4", 3/8", 1/2" Swagelok® fittings.
- For Swagelok® fittings in new installations only.

Description	qty.	cat.#
Gap Inspection Gauge	ea.	22624

LC Accessories


25259


25270

For even more options, visit
www.restek.com/lcacc

Preventive Maintenance (PM) Kits for Agilent HPLC Systems

Description	Model #	Similar to Agilent part #	qty.	cat.#
Autosampler PM Kit Includes: rotor seal, needle seat, needle assembly, seat cap	1050	01078-68721	kit	25259
Autosampler PM Kit Includes: rotor seal, piston seals (2), needle assembly, needle seat, finger caps (3)	1100, 1200	G1313-68709	kit	25271
Pump PM Kit Includes: PTFE frits (2), outlet cap, gold disk seal, active inlet cartridge, piston seals (4), glass solvent filters (2)	1050, 1100, 1200	G1311-68710	kit	25270


25271


25258


25278


25272


25265


25275


25349


26424


25058

Injector & Autosampler Supplies for Agilent HPLC Systems

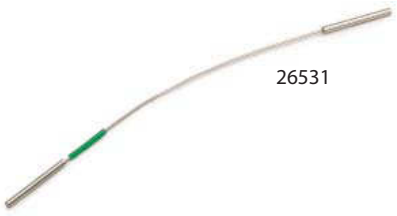
Description	Model #	Similar to Agilent part #	qty.	cat.#
Needle Seat	1050, 1090	79846-67101	ea.	25258
Needle Seat Assembly	1100, 1200	G1313-87101	ea.	25265
Needle Assembly	1100, 1200	G1313-87201	ea.	25278
Rotor Seal, 2-Groove (not for use with 7125 injection valve)	1050	0101-0626	ea.	25272
Rotor Seal, 2-Groove	1100, 1200	0100-1853	ea.	25275
Rotor Seal (Rheodyne-Style), 3-Groove	1090	1535-4048	ea.	25349
Stator Face Assembly	1100, 1200	0100-1851	ea.	26424
Connecting Tube	1050, 1100	G1311-67304	ea.	25058
Injector Lubricant, PTFE, 10 g	1050, 1100	79841-65501	ea.	26520
Solvent Inlet Filter, SS	1050, 1090, 1100, 1200	01018-60025	ea.	26423

26520


26423


26525


26530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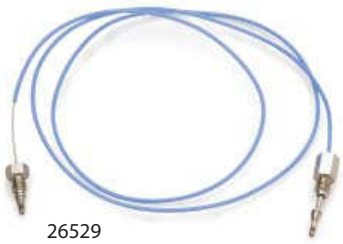
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26532


26527


26533


26537


26528

Capillary Stainless Steel Tubing Assemblies for Agilent HPLC Systems

- Precut, micropolished tubing and preseated fittings for quick, easy maintenance of your Agilent HPLC systems.
- Meet or exceed manufacturer's performance.

Description	Model #	Similar to Agilent part #	qty.	cat.#
Capillary SS Tubing With Fittings, 130 mm x 0.17 mm ID	1090	01090-87305	ea.	26525
Capillary SS Tubing With Fittings, 800 mm x 0.17 mm ID	1050	01078-87305	ea.	26526
Capillary SS Tubing With Fittings, 180 mm x 0.17 mm ID	1100	G1313-87305	ea.	26527
Capillary SS Tubing With Fittings, 700 mm x 0.25 mm ID	1050	01018-67305	ea.	26528
Capillary SS Tubing With Fittings, 700 mm x 0.25 mm ID	1050	01078-87306	ea.	26529
Seat Capillary, SS Tubing, 0.17 mm ID	1050	01078-87303	ea.	26530
Capillary SS Tubing, 105 mm x 0.17 mm ID	—	5021-1816	ea.	26531
Mixing Capillary Assembly	1100	G1312-67302	ea.	26532
Capillary SS Tubing, Valve to Metering Head	1100	G1313-87301	ea.	26533
Capillary SS Tubing, 150 mm x 0.17 mm ID	—	5021-1817	ea.	26534
Capillary SS Tubing, 280 mm x 0.17 mm ID	—	5021-1818	ea.	26535
Capillary SS Tubing, 400 mm x 0.17 mm ID	—	5021-1819	ea.	26536
1/16" Fitting, Front and Back Ferrules, Stainless Steel	—	5062-2418	10-pk.	26537


22482


25347


25268


25269


25277


26393


25139


25267


25266


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Pump Supplies for Agilent HPLC Systems

Description	Model #	Similar to Agilent part #	qty.	cat.#
Piston Seals, PTFE w/Graphite, Black*	1050, 1100, 1200	5063-6589	2-pk.	22482
Piston Seals, PTFE w/Graphite, Black*	1050, 1100, 1200	5063-6589	10-pk.	22483
Piston Seals, Black, ASI	1050, 1100	5068-8516	10-pk.	25176
Piston Seals, Black	1090	5062-2494	4-pk.	25347
Seal Wash Kit, Binary Pump (4 seals, 4 gaskets)	1050, 1100, 1200	—	kit	25268
Seal Wash Kit (2 seals, 2 gaskets)	1050, 1100, 1200	—	kit	25269
Wash Seal	1050, 1100, 1200	0905-1175	ea.	25277
Active Inlet Cartridge	1050, 1100, 1200	5062-8562	ea.	26393
Seal, Gold Disk (outlet)	1050, 1100, 1200	5001-3707	ea.	25467
Outlet Cap	1050, 1100, 1200	5062-2485	4-pk.	25139
Outlet Cap & Gold Seal Assembly	1050, 1100, 1200	—	2-pk.	25140
Outlet Ball Valve, Binary Pump	1100, 1200	G1312-60012	ea.	25267
Outlet Ball Valve	1050, 1100, 1200	G1311-60012	ea.	25276
Sieves for Outlet Valve	1100, 1200	5063-6505	10-pk.	25266
Check Valve Cartridge Assembly	1090	79835-67101	ea.	25344
Frits, PTFE	1050, 1100, 1200	01018-22707	5-pk.	25466
Plunger Assembly	1050, 1100, 1200	5063-6586	ea.	25273
Sapphire Piston	1090	3980-0672	ea.	25345

*Graphite-filled PTFE; best for organic solvents.

For even more options, visit **www.restek.com/lcacc**

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Lamps for Agilent HPLC Systems

Description	Model #	Similar to Agilent part #	qty.	cat.#
Detector Lamp, 1090 DA, 1050 VW/DA/MWD	1090, 1050	79883-60002	ea.	25260
Lamp, DAD G1315A, G1365A	1100, 1200	2140-0590	ea.	25261
Lamp, VWD G1314A	1100, 1200	G1314-60100	ea.	25262
G1321 Fluorescence Detector Flash Lamp	—	2140-0600	ea.	25264
Lamp, DAD Long-Life Deuterium (2,000 hours)	1100	2140-0813	ea.	25399
8453 Deuterium Lamp	—	2140-0605	ea.	25263

Other Supplies for Agilent HPLC Systems

Description	Model #	Similar to Agilent part #	qty.	cat.#
Bottle Head Assembly	—	G1311-60003	ea.	25059
Helium Tubing, PTFE, 5 m x 0.057" ID	1050, 1100	5062-2461	ea.	24990

Injector & Autosampler Supplies for PerkinElmer HPLC Systems

Description	Model #	Similar to PE part #	qty.	cat.#
Needle	PE Series 200 Pumps	N2930023	ea.	25432


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Pump Supplies for PerkinElmer HPLC Systems

Description	Model #	Similar to PE part #	qty.	cat.#
Low-Pressure Seal, Gold*	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	09907339	ea.	25435
Standard High-Pressure Seal, Gold*	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	09907324	ea.	25434
Standard Pump Seal Kit	200 Series	N2910383	kit	26425
High-Pressure Seal Kit Includes: pump seals (4), backup rings (4), O-ring (4)	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620	02540275	kit	25433
Inlet Check Valve	Int. 4000, 1, 10, 2, 200 Series, 250, 3, 3B, 4, 400, 410, 620, Series 200 Micropump	02540177	ea.	25438
Outlet Check Valve	PE 200, 4, 250, 400, 410, 620	02540197	ea.	25437

*Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.


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Deuterium Lamps for PerkinElmer HPLC Systems

Description	Model #	Similar to PE part #	qty.	cat.#
Deuterium Lamp	Lambda–2, 5, 7, 9, 10, 11, 12, 14, 15, 16, 17, 18, 19, 20, 25, 40, 800, 900	B0160917	ea.	25436
Deuterium Lamp	200 Series, 785A	N2920149	ea.	25431


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For even more options, visit
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Injector & Autosampler Supplies for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu part #	qty.	cat.#
Needle Seal, Vespel	LC-2010, SIL-10ADvp, 10AXL	228-33355-04	ea.	25468
Rotor Seal	SIL-10ADvp	228-21217-97	ea.	24986
Rotor Seal Assembly	SIL-10A, 10AXL, 10Ai	228-21217-91	ea.	25469
Stator Assembly	SIL-10A, 10AXL, 10Ai	228-21220-91	ea.	25470
Syringe, 500 µL	SIL-10A, 10AXL, 10Ai	228-25237-04	ea.	25471

Deuterium Lamps for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu part #	qty.	cat.#
Deuterium Lamp	SPD-10, 10A, 10AVvp, SPD-20A, SPD-20AV	228-34016-02	ea.	25284


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Pump Supplies for Shimadzu HPLC Systems

Description	Model #	Similar to Shimadzu part #	qty.	cat.#
Plunger Seal, Polyethylene, Gold**	LC-10Ai, 10AS, 10AT, 10ATvp, LC-7A	228-21975-00	ea.	25290
Plunger Seal, Black*	LC-10AD, 10ADvp, LC-20AD/AB, LC-600, LC-2010 A/C HT, LC-9A	228-35146-00	ea.	24980
Plunger Seal, Gold**	LC-10ADvp, LC-20AD/AB	228-32628-00	ea.	24981
Plunger Seal, Black*	LC-10ATvp, LC-20AT, LC-HT, SIL-10ADvp, SIL-2010 A/C HT, SIL-20A/AC, SIL-HT	228-35145-00	ea.	24985
Plunger Rinse Seal	LC-10Ai, LC-10AS, LC-10AT, LC-10ATvp	228-28499-00	ea.	25292
Inlet Check Valve	LC-6A, LC-10AS	228-12353-91	ea.	25287
Inlet Check Valve	LC-600, LC-9A, LC-10AD	228-18522-91, 228-33492-91	ea.	25295
Inlet Check Valve	LC-10ADvp	228-39093-92	ea.	24984
Inlet Check Valve	LC-10AT, LC-10ATvp	228-32166-91	ea.	26521
Inlet Check Valve	LC-20AD/AB XR	228-48249-91, 228-45704-91	ea.	26426
Outlet Check Valve	LC-6, LC-10AS, LC-8A	228-09054-93	ea.	25288
Outlet Check Valve Rebuild Kit Includes: ruby ball (2), seat (2), thin washer (2), thick washer (2), retainer washer (2)	LC-6A, LC-10AS	228-11200-91	kit	25289
Outlet Check Valve	LC-600, LC-9A, LC-10AD, LC-10AT	228-18522-92, 228-32531-92	ea.	25282
Outlet Check Valve	LC-10ADvp, LC-10ATvp	228-34976-91	ea.	24983
Outlet Check Valve	LC-20AD/AB XR	228-45705-91, 228-45563-91	ea.	26427
Sapphire Plunger	LC-10AS, LC-7A	228-17019-93	ea.	25291
Sapphire Plunger	LC-600, LC-9A, LC-10AD	228-18523-91	ea.	25294
Plunger Assembly, Ceramic	LC-10ADvp	228-35601-91	ea.	25472
Plunger Assembly, Ceramic	LC-10ATvp	228-35009-92	ea.	25473
Plunger Assembly, Sapphire	LC-10ADvp	228-35601-92	ea.	24982

*Graphite-filled PTFE; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.

For even more options, visit
www.restek.com/lcacc


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Injector & Autosampler Supplies for Thermo HPLC Systems

Description	Model #	Similar to Thermo part #	qty.	cat.#
Rotor Seal Assembly, Rheodyne 7010	TSP AS100, 300, 1000, 3000, 3500, 8875, and 8880 Autosamplers	1535-4048, 7010-039, 2508-0360	ea.	25481
Syringe Assembly, 250 µL	1000, CM3000, CM3500, AS100	A3588-020	ea.	25482
Syringe, 500 µL	8800 Series	3301-0100	ea.	25483

Lamps for Thermo HPLC Systems

Description	Model #	Similar to Thermo part #	qty.	cat.#
Lamp, UV	Spectrachrom 200, UV100, UV1000, UV150, UV200, UV2000, UV3000	9551-0023	ea.	25484

Pump Supplies for Thermo HPLC Systems

Description	Model #	Similar to Thermo part #	qty.	cat.#
Inlet Check Valve Assembly	8800, 8810, ISOCHROM, P1000, P2000, P4000	A3495-010	ea.	25474
Outlet Check Valve Assembly	8700, 8800, 881, ISOCHROM	A3490-010	ea.	25475
Transducer Check Valve Assembly	P1000, P2000, P4000	A3990-010	ea.	25479
Check Valve Cartridge	3000, 3200, 3500, 4000, 4100, Constametric I, II, and III	900946	ea.	25485
Piston	8800, 8810, ISOCHROM, P1000, P2000, P4000	A3102-010	ea.	25476
Sapphire Plunger	CM3000, CM3200, CM3500, CM4000	801306	ea.	25486
Back-Up Seal	8800, 8810, ISOCHROM, P1000, P2000, P4000	A2963-010	ea.	25477
Plunger Seal, Gold Superseal**	8800, 8810, ISOCHROM, P1000, P2000, P4000	A2962-010	ea.	25478
Plunger Seal Kit, Gold** Includes: SS plunger seal spacer, Rulon plunger seal spacer (2), O-ring, gold plunger seal	LDC Constametric Pumps	801892001	kit	25487
Plunger Seal, Black*	CM3000, CM3200, CM3500, CM4000	206129001	ea.	25488
Plunger Seal, Gold**	CM3000, CM3200, CM3500, CM4000	206156001	ea.	25489
Kel-F Washer	P1000, P2000, P4000	A4848-010	ea.	25480

*Graphite-filled PTFE; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.


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Simplify Routine LC Maintenance

Preventive Maintenance Kits

- Significant savings over instrument manufacturer prices.
- High-quality components in every kit.
- Wide range of options for HPLC systems and pumps.

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Preventive Maintenance (PM) Kits for Waters HPLC Systems

Description	Model #	Similar to Waters part #	qty.	cat.#
2690/2695 Pump & Autosampler PM Kit Includes: sapphire plungers (2), seal wash plunger seals (4), head plunger seals (4), wash tube seals (4), battery, sparge diffuser, filter insert, face seals (4), solvent reservoir 10 µm filters (4), 250 µL syringe, check valve cartridges (2), wash tube seal, seal wash tube, PTFE washer, filter retainer, lower wash seal frit, needle wash frit, TFE washer, needle assembly, gold injector seals (2), stainless steel ferrule, compression screw	Alliance 2690, 2695	WAT270944	kit	25143
717 Autosampler PM Kit Includes: seal pack assembly, tube assembly (0.020" mm ID), needle, needle compression screw, 0.062 stainless steel ferrule, pre-column filter assembly, filter insert, 250 µL WISP syringe	717 Autosampler	WAT052669	kit	25145
600 Pump PM Kit Includes: PerformancePLUS cartridges (4), sparge diffusers (4), Super Seals (2), solvent reservoir 10 µm filters (4), sapphire plungers (2), reference valve button, valve disk spacer, valve disk, TFE ball plug, TFE seat, ruby ball, inlet tube body assembly manifold insert, insert seal, belleville washers (2), flat washer	600 Pump	WAT052675	kit	25144
616 Pump PM Kit Includes: sapphire plungers (2), sparge diffusers (4), solvent reservoir 10 µm filters (4), plunger seals (2), plunger wash seals (2), O-rings (2), backup rings (2), check valve cartridges (4)	616 Pump	WAT052672	kit	25146
515 Pump PM Kit Includes: PerformancePLUS check valves (4), sparge diffuser, solvent reservoir 10 µm filter, sapphire plungers (2), plunger seals (2), pivot inserts (2), pivot guides (2), washer (2), plunger springs (2), retaining rings (2)	515 Pump	WAT052587	kit	26519
1525 Pump PM Kit Includes: sapphire plungers (4), check valve cartridges (8), plunger seals (4), solvent reservoir 10 µm filters (2), reference valve button, valve disk spacer, valve disk	1525 Pump	201000114	kit	26430

Injector & Autosampler Supplies for Waters HPLC & ACQUITY UPLC® Systems

Description	Model #	Similar to Waters part #	qty.	cat.#
Needle Assembly, 0.010 mm ID	ACQUITY	700002644	ea.	25942
Sample Loop, 10 µL	ACQUITY, nanoACQUITY	430001326	ea.	25943
Wash Station O-Ring	ACQUITY, nanoACQUITY	700002572	ea.	25944
Metering Syringe, 100 µL	ACQUITY, nanoACQUITY	700002570	ea.	25945
Tube Assembly, Inject Outlet	ACQUITY	430001084	ea.	25946
Tube Assembly, System Outlet	ACQUITY	430001486	ea.	25947
Seal Pack Rebuild Kit, Without Seal Wash Tube Assembly Includes: wash tube seal, seal wash tube, PTFE washer, filter retainer, lower wash seal frit, needle wash frit, TFE washer, needle, injector seal (2), compression screw, ferrule	2690, 2695	WAT271019	kit	25495
Seal Pack With Needle Includes: seal pack assembly, pre-column filter assembly, needle, 0.020" ID tube assembly, compression screw, ferrule	717, LC Module 1	WAT045559	ea.	25496
Vespel Rotor Seal	1090, 7000, 7010, 7040, 7067	7010-039	ea.	25279
Vespel Rotor Seal	7125, 7126, 7725, 7725i, 9725	7125-047	ea.	25280
Isolation Seal	7010	7010-015	ea.	25281


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Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (Also see pages 310–311.)

Description	Model #	Similar to Waters part #	qty.	cat.#
Head Plunger Seal Kit Includes: head plunger seals (2), back-up washers (2)	ACQUITY, nanoACQUITY	700002599	kit	26428
Wash Seal	ACQUITY, nanoACQUITY	700002598	2-pk.	26429
Pump O-Ring	ACQUITY, nanoACQUITY	WAT076152	ea.	25951
In-Line Filter Assembly, Stainless Steel Frit	ACQUITY, nanoACQUITY	289003547	ea.	25952
Filter Frit Cartridge, Stainless Steel	ACQUITY	700002913	ea.	25953
Solvent Bottle Filters	ACQUITY	700003616	7-pk.	25954
Tube Assembly, SSV to In-line Filter	nanoACQUITY	430001470	ea.	25948
Tube Assembly, Transducer to Check Valve, BSM	ACQUITY, nanoACQUITY	430001121	ea.	25949
Tube Assembly, Transducer to Check Valve, QSM	ACQUITY	430002357	ea.	25950
Tube Assembly, SSV to I2V	ACQUITY	430001443	ea.	25941
Super Seal for Analytical Heads	M6KA,1515, 1525, 510, 515, 590, 600, 610, LC Module 1	WAT022946	ea.	25374
Plunger Seal, Gold**	1515, 1525, 510, 515, 600, 610, LC Module 1	—	ea.	25375
Plunger Seal, Black*	1515, 1525, 510, 515, 600, 610, LC Module 1	WAT026613	ea.	25378
Plunger Seal, Gold for EF Heads**	510, 515, 590, 600, 610, LC Module 1	700002282	ea.	25380
Plunger Seal, Black for EF Heads*	510, 515, 590, 600, 610, LC Module 1	WAT026644	ea.	25379
Pump Seal Kit Includes: plunger seals (2), wash seals (2), O-rings (2), back-up rings (2)	616, 1525 Micro	WAT034515	kit	25497
Seal Wash Plunger Seals	2690, 2695, 2790, 2795	WAT270160, WAT271018	2-pk.	25386
Head Plunger Seals, Gold	2690, 2695, 2790, 2795	WAT270789, WAT270938	2-pk.	25387
Head Plunger Seals, Black	2690, 2695, 2790, 2795	WAT271066	2-pk.	25388
Seal Wash Face Seal	2690, 2695, 2790, 2795	WAT271017	ea.	25428
Wash Tube Seal Kit	2690, 2695, 2790, 2795	WAT270940	4-pk.	25429
Face Seals Replacement Kit	2690, 2695, 2790, 2795	WAT270163, WAT270939	4-pk.	26547


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*Graphite-filled PTFE; best for organic solvents.
**Ultra-high molecular weight polyethylene (UHMWPE); increased resistance to abrasion; best for buffers.

Instrument Replacement Parts for Waters HPLC & ACQUITY UPLC® Systems


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Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (cont.)

Description	Model #	Similar to Waters part #	qty.	cat.#
Primary Check Valve	ACQUITY, nanoACQUITY	700002596	2-pk.	25955
Accumulator Check Valve (Double Ball & Seat)	ACQUITY, nanoACQUITY	700002968	2-pk.	25956
I2 Check Valve Cartridge	ACQUITY	700005165	ea.	25957
Inlet Check Valve Assembly	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT033679, WAT025214	ea.	25360
Inlet Check Valve Housing	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT025203	ea.	25361
Inlet Check Valve Rebuild Kit Includes: blue washer (2), retainer gasket (2), Kel-F insert (2), ruby ball (2), TFE seat (2), TFE washer (2)	M6KA, 510, 515, 590, 600, 610, LC Module 1	WAT060495	kit	25362
Outlet Check Valve Assembly (Actuator Style)	M6KA, 510, 590	WAT025028	ea.	25363
Outlet Check Valve Housing (Actuator Style)	M6KA, 510, 590	WAT025212	ea.	25364
Outlet Check Valve Rebuild Kit (Actuator Style) Includes: 2 µm cup filter (2), compression spring (2), actuator (2), TFE washer actuator seat (2), TFE washer (2)	M6KA, 510, 590	WAT026016	kit	25365
Outlet Check Valve Assembly (Ball & Seat Style)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT025216	ea.	25366
Outlet Check Valve Housing (Ball & Seat Style)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT025207	ea.	25367
Outlet Check Valve Rebuild Kit (Ball & Seat Style) Includes: 2 µm cup filter (2), ruby ball (2), ball seat (2), Kel-F insert (2), blue washer (2), washer (2)	1525EF, 510, 515, 600, 610, LC Module 1	WAT026014	kit	25368
Inlet Check Valve Assembly, 225 µL (Extended Flow)	1525EF, 510, 515, 600, 610, LC Module 1	WAT060307	ea.	25369
Check Valve Rebuild Kit (Extended Flow) Includes: $^{3}/_{16}$" EF ruby ball (2), EF ball seat (2), EF guide seal (2), EF ball guide (2), EF housing seal (2)	510, 590, 600, LC Module 1	WAT088223	kit	25371
PerformancePLUS Check Valve Housing	1515, 1525, 510, 515, 525, 600, 610	—	ea.	25372
PerformancePLUS Check Valve Cartridge	1515, 1525, 2690, 2695, 2795, 510, 515, 600, 610	700000254	2-pk.	25370
Check Valve Cartridges	2690, 2695, 2790, 2795	WAT270941	2-pk.	25373
Check Valve Cartridge, Stainless Steel	616	WAT024960	ea.	25498


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Pump Supplies for Waters HPLC & ACQUITY UPLC® Systems (cont.)

Description	Model #	Similar to Waters part #	qty.	cat.#
Sapphire Plungers	ACQUITY, nanoACQUITY	700002600	2-pk.	25958
Sapphire Plunger	M6KA, 510, 590, 600, 610, LC Module 1	WAT025656, WAT069511	ea.	25381
Sapphire Plunger (Extended Flow)	1525EF, 510, 515, 590, 600, 610, LC Module 1	WAT060304	ea.	25382
Sapphire Plunger Assembly Kit Includes: sapphire plunger, pivot insert, pivot guide, washer, spring, retaining ring	515, 1515, 1525	WAS207069	kit	25384
Sapphire Plunger	616, 625, 626, 1525 Micro	WAT031788, WAT0270488	ea.	25420
Sapphire Plunger	2690, 2695, 2790, 2795, 2796	WAT270488, WAT2710678, WAT270959	ea.	25385
Draw-Off Tube Assembly	M6KA, 510, 515, 590, 600, 610	WAT060476	ea.	25392
Indicator Manifold Kit Includes: TFE ball plug, TFE seat, ruby ball, manifold insert, TFE insert seal, belleville washer (2), flat washer, inlet tube body assembly	M45, 501, 510, 515, 590, 600, 610	WAT060448	kit	25412
Reference Valve Rebuild Kit Includes: ref valve button, valve disk spacer, valve disk	600 Pump	WAT025746	kit	25492
Ferrule, Stainless Steel	—	WAT022330	ea.	25417
Compression Screws, Stainless Steel	—	WAT025313	2-pk.	25493
Battery	2690, 2695, 717, 486, 484	WAT080443	ea.	25494

Instrument Replacement Parts for Waters HPLC & ACQUITY UPLC® Systems


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Detector Supplies for Waters HPLC & ACQUITY UPLC® Systems

Description	Model #	Similar to Waters part #	qty.	cat.#
Xenon Lamp (without holder or mirror)	470	—	ea.	25404
Xenon Lamp	474	—	ea.	25405
Deuterium Lamp (UV/Vis)	484	WAT080357	ea.	25406
Deuterium Lamp (UV/Vis)	486	WAT080678	ea.	25407
Deuterium Lamp, Long Life (2,000 hours)*	486	WAT080678	ea.	25410
Deuterium Lamp	996, 2996	WAT052586	ea.	25408
Deuterium Lamp	2487, 2488	WAS081142	ea.	25409
Window Gasket	484, 486, 490	WAT080335	ea.	25423
Lamp Side Gasket	484, 486, 490	WAT080336	ea.	25424
Quartz Lens	486	WAT080687	ea.	25427

*Standard lamps have nominal 1,000-hour life.

EXP® Reusable Fittings for HPLC & UHPLC for 10-32 fittings and 1/16" tubing

NEW!

- Hand-tight fitting style achieves effortless HPLC seals—no tools needed!
- Both hand-tight and hex-head styles wrench-tighten for reliable UHPLC use.
- Patented ferrule can be installed repeatedly without compromising high-pressure seal.
- Hybrid design combines the durability of titanium with the sealing ability of PEEK.
- Cutting-edge system provides ZDV (zero dead volume) connection to any 10-32 female port.
- Compatible with 1/16" PEEK and stainless steel tubing.

Restek is pleased to offer the reusable EXP® fitting system from Optimize Technologies for the ultimate in easy, reliable LC connections!

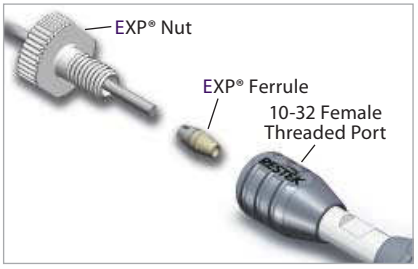
The patented hybrid EXP® ferrule combines the durability of titanium with the sealing ability of PEEK for a swage that can be reused over and over again. And, when you choose the hand-tight fitting style, the special EXP® nut offers an effortless seal up to 8,700+ psi (600+ bar)—no tools needed! For a reliable 20,000+ psi (1,400+ bar) UHPLC connection with either fitting style, simply wrench-tighten an extra 1/4 to 1/2 turn.

EXP® ferrules should only be used with genuine EXP® nuts. When used with an EXP® nut, the EXP® ferrule provides repeated ZDV (zero dead volume) connections to any 10-32 female threaded port, including Restek LC columns, 6-port injection valves, and more.

WARNING: Do not use EXP® ferrules with standard nuts. Failure to use EXP® fittings according to the included instructions may result in unsafe UHPLC connections and/or non-ZDV connections.

EXP® Hand-Tight Fittings

Description	qty.	cat.#
EXP Hand-Tight Fitting (Nut w/Ferrule)	ea.	25937
EXP Hand-Tight Fitting (Nut w/Ferrule)	10-pk.	25938
EXP Hand-Tight Nut (w/o Ferrule)	ea.	25939



EXP® Hex-Head Fittings

Description	qty.	cat.#
EXP Std. Hex-Head Fitting (Nut w/Ferrule)	ea.	25926
EXP Std. Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25927
EXP Short Hex-Head Fitting (Nut w/Ferrule)	ea.	25928
EXP Short Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25929
EXP Long Hex-Head Fitting (Nut w/Ferrule)	ea.	25930
EXP Long Hex-Head Fitting (Nut w/Ferrule)	10-pk.	25931
EXP Std. Hex-Head Nut (w/o Ferrule)	ea.	25932
EXP Short Hex-Head Nut (w/o Ferrule)	ea.	25933
EXP Long Hex-Head Nut (w/o Ferrule)	ea.	25934

EXP® Hand-Tight Coupler

Description	qty.	cat.#
EXP Hand-Tight Coupler (2 Nuts, 2 Ferrules, 1/16" x 0.005" ID Tubing)	ea.	25940

EXP® Titanium Hybrid Replacement Ferrules

Description	qty.	cat.#
EXP Titanium Hybrid Ferrule	ea.	25935
EXP Titanium Hybrid Ferrule	10-pk.	25936

Hybrid Ferrule U.S. Patent No. 8201854, Optimize Technologies. Optimize Technologies EXP Holders are Patent Pending. Other U.S. and Foreign Patents Pending. The Opti- prefix is a registered trademark of Optimize Technologies, Inc.

Universal 10-32 PEEK Column Connectors and Plugs

Universal PEEK connectors allow easy installation of all 1/16-inch tubing, including stainless steel.

Description	qty.	cat.#
PEEK Column Connector (beige, round body)	10-pk.	25015
PEEK Column Plug (black)	10-pk.	25016
PEEK Fingertight Fittings (blue, flat-sided)	10-pk.	25324

Rheodyne® Style Nut and Ferrule

Replacement long nut for connecting stainless steel tubing to a Rheodyne® 6-port valve or other Rheodyne® part.

Description	qty.	cat.#
1/16" Rheodyne Style Nut	10-pk.	25095
1/16" Rheodyne Style Ferrule	10-pk.	25096

Zero-Dead-Volume Valco® Internal Union

Ends of tubing seat squarely at bottoms of fitting details. 300-series stainless steel. For 1/16" OD tubing. Stainless steel ferrules included.

Description	Union Bore	Valco #	qty.	cat.#
Internal Union	0.15 mm	ZU1XC	ea.	20147
Internal Union	0.25 mm	ZU1C	ea.	20148
Internal Union	0.75 mm	ZU1	ea.	20149
Internal Union	1/16"	ZU1T	ea.	20150

PEEK Union Connector

Quickly and reliably connect two pieces of 1/16-inch tubing. 0.3 mm union bore. End fittings included.

Description	qty.	cat.#
PEEK Union Connector 1/16"	2-pk.	25323

LC-MS Gas Generators From Restek

Affordable

Generators are cost-effective and quickly pay for themselves.

Reliable

Dependably produce a continuous supply of high-purity carrier and fuel gas.

Safe

Eliminate hazardous cylinders and free up valuable lab space.

See **page 325**.

www.restek.com/gas

LC Stainless Steel Capillary Tubing

- 316-grade stainless steel.
- Precise precut lengths.
- Smooth surface finish.
- Ultra clean.

Whether you need to replace system tubing as part of your troubleshooting or want to reduce the dwell volume of your system as you move to narrower columns, Restek has the quality tubing in the lengths and IDs you need. Each ID is color coded, so it is easy to identify and replace correctly.

Length	qty.	0.005" ID (red) max. 21,600 psi cat.#	0.007" ID (gray) max. 20,900 psi cat.#	0.010" ID (blue) max. 19,700 psi cat.#	0.020" ID (yellow) max. 15,800 psi cat.#
1/16" OD Tubing					
5 cm	3-pk.	25240	25244	25248	25252
10 cm	3-pk.	25241	25245	25249	25253
20 cm	3-pk.	25242	25246	25250	25254
30 cm	3-pk.	25243	25247	25251	25255


20188

Tubing Dressing Tool

Opens stainless steel tubing bore and removes burrs. For 1/16-inch OD tubing or 1/8-inch OD tubing.

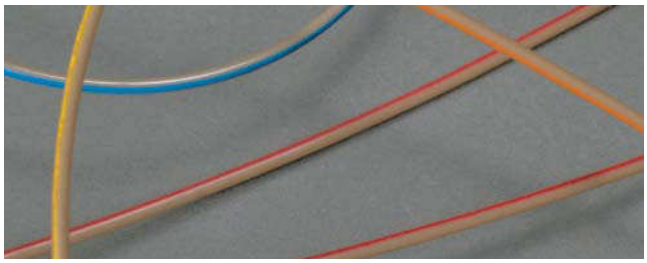
Description	Size	qty.	cat.#
Tubing Dressing Tool	1/16"	ea.	20188
Replacement Insert	for 1/16" Tubing Dressing Tool	ea.	20189
Tubing Dressing Tool	1/8"	ea.	20190
Replacement Insert	for 1/8" Tubing Dressing Tool	ea.	20191


25306

PTFE Tubing

- Ideal for mobile phase inlet lines.
- Chemically inert.
- Use to 500 psi (3,447 kPa) and 80 °C.

Description	OD	ID	Length	qty.	cat.#
PTFE Tubing	1/8"	0.063" (1.6 mm)	3 m	3 m	25306
PTFE Tubing	1/8"	0.094" (2.4 mm)	3 m	3 m	25307



Inert PEEK Tubing

- Replaces stainless steel, titanium, PTFE, or Tefzel® tubing.
- Less oxygen permeable and more temperature resistant (to 100 °C) than PTFE or Tefzel® tubing.
- Use with PEEK fingertight or flangeless fittings.
- Use tubing ≤ 0.007" to 7,000 psi; tubing ≥ 0.010" ID to 5,000 psi.

Description	OD	ID	Length	Color Code	qty.	cat.#
PEEK Tubing	1/16"	0.0025"	1 m	pink dash stripe	3-pk.	25320
PEEK Tubing	1/16"	0.005"	3 m	red stripe	ea.	25065
PEEK Tubing	1/16"	0.007"	3 m	yellow stripe	ea.	25066
PEEK Tubing	1/16"	0.010"	3 m	blue stripe	ea.	25067
PEEK Tubing	1/16"	0.020"	3 m	orange stripe	ea.	25068

Clean-Cut Tubing Cutter

- Burr-free, perpendicular cuts that will not distort the tubing OD or close the ID.
- Use on PEEK, PTFE, Tefzel®, and other polymeric tubing.


25069

Description	qty.	cat.#
Clean-Cut Tubing Cutter	ea.	25069
Replacement Blade for Clean-Cut Cutter	ea.	25070

Tubing Clip

Securely holds 1/16-inch or 1/8-inch tubing in beaker, flask, or bottle up to 4 mm thick.


25310

Description	qty.	cat.#
Tubing Clip	5-pk.	25310


25308


25309

PEEK Tubing Elbows

Tubing Elbows (90° and 180°) are ideal for routing 1/16-inch PEEK tubing through your system. Simply snap the tubing into the elbow. Prevent pinching of PEEK tubing, which can cause high pressure.

Description	qty.	cat.#
PEEK Tubing Elbow, 90°	5-pk.	25308
PEEK Tubing Elbow, 180°	5-pk.	25309


25336


25328

QuickSplit Post-Column Flow Splitters

Fluid resistor technology eliminates adjustments to capillary tubing for optimizing split ratio. Wide range of interchangeable resistors available.

Fixed Flow Splitters for HPLC & LC-MS

- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 10,000 psi (68,948 kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0 mL/min.

Adjustable Flow Splitter

- Adjustable metering valve gives convenient control of split ratio.
- Split ratio not affected by changes in viscosity or pressure.
- High operating pressure limit: 5,000 psi (34,474 kPa).
- Low dead volume—negligible effect on analyte bandwidth.
- Total flow: 0.1–5.0 mL/min.

Description	Split Ratio	qty.	cat.#
Binary Fixed, Post Column	100:1	ea.	25326
	50:1	ea.	25327
	20:1	ea.	25328
	10:1	ea.	25329
	5:1	ea.	25330
Replacement Fixed Resistor Set, Post Column	100:1	ea.	25331
	50:1	ea.	25332
	20:1	ea.	25333
	10:1	ea.	25334
	5:1	ea.	25335
Adjustable, Post Column	5:1 to 100:1	ea.	25336
	1:1 to 20:1	ea.	25337
	50:1 to 1000:1	ea.	26416
Replacement Adjustable Resistor Set, Post Column*	5:1 to 100:1	ea.	25338
	1:1 to 20:1	ea.	25339

*QuickSplit post-column flow splitter serial number required for replacement resistor set to ensure compatibility. Every resistor is manufactured per serial number. The serial number is located on top of the splitter.


LCLocker LC Organizer


Deluxe BenchBooster Organizer


Mini pHPerch Storage Unit


LC 30-Column Storage Cabinet


Book Holders


Open Supply Bins, 13-bin unit


TopLoader Balance-Bank Storage Unit


Glove Box Dispensers

LC Organizers*

Description	Dimensions	qty.	cat.#
LCLocker	24 x 12 x 6"	ea.	25149
BenchBooster	24 x 7 x 12"	ea.	25150
Mini pHPerch	13 x 12 x 6"	ea.	25147
TopLoader	12 x 12 x 7"	ea.	25148
30 Column Cabinet	17 x 15 x 3"	ea.	25159
Book Holder, 0.75" ID (Small)	4 1/2 x 6 x 1 1/4"	ea.	25151
Book Holder, 1.5" ID (Large)	4 1/2 x 6 x 1 3/4"	ea.	25152
Open Supply Bin	24 x 12 x 10" (4-Bin Unit)	ea.	25153
Open Supply Bin	12 x 16 x 10.5" (5-Bin Unit)	ea.	25154
Open Supply Bin	12 x 12 x 7.5" (13-Bin Unit)	ea.	25155
Glove Box Dispenser	5 1/8 x 11 x 4 1/4" (Single)	ea.	25156
Glove Box Dispenser	10 1/8 x 11 x 4 1/4" (Double)	ea.	25157
Glove Box Dispenser	15 1/8 x 11 x 4 1/4" (Triple)	ea.	25158

*Please note: Accessories and supplies in photographs are not included.

PEEK Fitting Extractor

Drill into the broken fitting, then screw the extractor into the fitting and remove it easily. Eliminates the need for heat or other techniques that could damage your column.

Description	qty.	cat.#
PEEK Fitting Extractor	ea.	25325

ValvTool Wrench

The ValvTool is a time-saving device that provides easy access to many hard-to-reach Rheodyne® or Valco® valves. For ¼-inch nuts.

Description	qty.	cat.#
ValvTool Wrench	ea.	25321

Use the flat side of the piston seal insertion tool to seat a Waters face seal.

LC Piston Seal Insertion Tool

Simplify pump maintenance: use one end to remove your old seal, then simply slip your new seal on the other end and push it flush into position. The tool cannot mar the surrounding metal surface of the pump housing.

Remove a seal

Seat a seal

Description	qty.	cat.#
LC Piston Seal Insertion Tool	ea.	21356

Outlet Cap and Gold Seal Assembly Tool for Agilent 1050 & 1100 HPLC Systems

Easily install the gold seal into the outlet cap.

Put the outlet cap on the male part of the assembly tool.

Push the assembly tool together, then hold on to the outlet cap and pull the assembly tool apart.

Put the gold seal over the pin on the male part of the assembly tool.

Push the assembly tool together and press the gold seal in the outlet cap.

Pull the assembly tool apart and remove the assembled outlet cap and gold seal.

Description	qty.	cat.#
Outlet Cap and Gold Seal Assembly Tool for Agilent 1050 & 1100 HPLC Systems	ea.	24989
Seal, Gold Disk (outlet)	ea.	25467
Outlet Cap	4-pk.	25139
Outlet Cap & Gold Seal Assembly	2-pk.	25140

Hub-Cap 4-Liter Bottle Tops

Hub-Cap bottle tops are a great way to neatly keep your mobile phase lines where they belong. Use them instead of plastic paraffin film, aluminum foil, or tape on your mobile phase reservoirs.


26541

Description	qty.	cat.#
Hub-Cap (assembly of the bottle cap and plug)	kit	26541
Hub-Cap Multi-Pack	3-pk.	26542

Hub-Cap Adapters

Allow the use of the Opti-Cap® Top (see right—cat.# 25300) with 4-liter solvent bottles.

Description	qty.	cat.#
Hub-Cap Adapter (allows use of the Opti-Cap w/4 L solvent bottles)	ea.	26538
Hub-Cap Adapter Multi-Pack	3-pk.	26539
Hub-Cap Adapter and Opti-Cap (for use w/GL-45 solvent bottles)	kit	26540

Related Items and Replacement Parts for Hub-Cap 4-Liter Bottle Tops

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
PTFE Tubing, 1/8" OD x 0.094" (2.4 mm) ID x 3 m	3 m	25307
PTFE Tubing, 1/8" OD x 0.063" (1.6 mm) ID x 3 m	3 m	25306
PEEK Plug, 1/4"-28 threads	3-pk.	25319

Opti-Cap® GL-45 Bottle Tops

The most economical way to helium-sparge and deliver LC mobile phases.

Opti-Cap® tops fit all standard GL-45 bottles and have two 1/8-inch holes and one 1/16-inch hole for tubing. All three openings are designed for threaded PEEK plugs.


25303

Description	qty.	cat.#
Opti-Cap (Cap and PEEK Plug)	ea.	25300
Opti-Cap Kit (Opti-Cap, 3 meters of tubing, sparging filters)	kit	25301
Opti-Cap Kit with 1 L Bottle	kit	25302
Opti-Cap Kit with 2 L Bottle	kit	25303

Opti-Cap® Adapters


27197 26551

Allow the use of the Hub-Cap Top (see left—cat.# 26541) with GL-45 solvent bottles.

Description	qty.	cat.#
Opti-Cap Adapter (allows use of Hub-Cap w/GL-45 solvent bottles)	ea.	27197
Opti-Cap Adapter Multi-Pack	3-pk.	27198
Opti-Cap Adapter w/Hub-Cap	kit	26551

Related Items and Replacement Parts for Opti-Cap® GL-45 Bottle Tops

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
PTFE Tubing, 1/8" OD x 0.094" (2.4 mm) ID x 3 m	3 m	25307
PTFE Tubing, 1/8" OD x 0.063" (1.6 mm) ID x 3 m	3 m	25306
PEEK Plug, 1/4"-28 threads	3-pk.	25319
1 L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25304
2 L Graduated Safety-Coated Bottle – GL-45 threads	ea.	25305

Which Bottle Top Do I Need?

I have a 4-Liter bottle...

Option 1: Hub-Cap Top (cat.# 26541)

or

Option 2*: Opti-Cap® Top (cat.# 25300) *plus* Hub-Cap Adapter (cat.# 26538)

**Also available as a kit (cat.# 26540)*

Option 1


26541

Option 2*


25300 26538


**Also available as a kit (cat.# 26540)*

I have a GL-45 bottle...

Option 1: Opti-Cap® Top (cat.# 25300)

or

Option 2*: Hub-Cap Top (cat.# 26541) *plus* Opti-Cap® Adapter (cat.# 27197)

**Also available as a kit (cat.# 26551)*

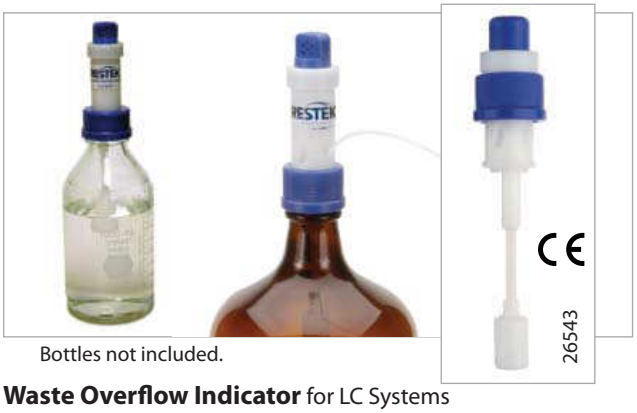
Option 1


25300

Option 2*


26541 27197


**Also available as a kit (cat.# 26551)*



Bottles not included.

Waste Overflow Indicator for LC Systems

- Avoid messy pooling around mobile phase waste containers.
- Audible alarm instantly alerts user, preventing overflow.
- Compact, battery-operated unit.
- Available for 4-liter and GL-45 solvent bottles.

The Restek waste overflow indicator will help keep your mobile phase waste where it belongs—in the waste container! Compact, battery-operated unit fits securely on solvent bottles and accommodates two waste streams. An audible alarm is given as the solvent waste container approaches capacity, giving you time to empty or change the container. Another innovative design from Restek!

Description	qty.	cat.#
Waste Overflow Indicator for LC Systems, 4 Liter	ea.	26543
Waste Overflow Indicator for LC Systems, GL-45	ea.	26550
Replacement AA Battery for the Waste Overflow Indicator	ea.	26544
Replacement AA Batteries for the Waste Overflow Indicator	3-pk.	26545

Reduce Solvent Waste
With the Last Drop Filter
See **page 320**.

tech tip

Mobile Phase Additives
Mobile phase additives such as triethylamine, trifluoroacetic acid, and ion-pairing reagents can compete with sample ions, decreasing sensitivity and, in some cases, reducing sample ion intake into the MS. To obtain symmetric peaks and/or sufficient retention, use base deactivated, state-of-the-art Type B silica packings that minimize the need for additives.

26395

Polypropylene
Membrane Filters

Hub-Cap Filter Kit

Kit includes: bottle adapter, bottle adapter nut, filter inlet cap, grid support, vacuum hose barb, tube compression fitting, 47 mm grid, 47 mm 0.22 µm filter membrane, 47 mm 0.45 µm filter membrane, 1/4" OD x 1/8" ID ultra chemical resistant, FEP-lined Tygon® tubing (3'), 6" x 6" box with shrink-wrap insert. Includes universal threads designed for 4 L or Wheaton bottles. Use with GL-45 bottles requires Opti-Cap® adapter (sold separately).

Bottle not included.

Assembles quickly and easily!

Unscrew and lift off top.

Place membrane filter on top of grid.

Reattach top.

Connect vacuum line to side port.

Description	qty.	cat.#
Hub-Cap Filter Kit for 4 L or Wheaton bottles	kit	26395
Replacement Membrane Filters	**qty.**	**cat.#**
Polypropylene Membrane Filters, 47 mm, 0.45 µm	100-pk.	26396
Polypropylene Membrane Filters, 47 mm, 0.22 µm	100-pk.	26397
Nylon Membrane Filters, 47 mm, 0.45 µm	100-pk.	26398
Nylon Membrane Filters, 47 mm, 0.22 µm	100-pk.	26399

Last Drop Filter

The flat filter element sits parallel to the bottom of the mobile phase reservoir, allowing the filter to draw 98% of the mobile phase without drawing air into the system. Conventional cylindrical mobile phase filters begin to draw air into the system when approximately 10% of the solvent remains in the reservoir. The Last Drop filter allows more analyses per batch of mobile phase and helps reduce hazardous waste. 22.1 mm OD.


25314

Description	qty.	cat.#
Last Drop Filter, 2 µm	ea.	25314
Last Drop Filter, 10 µm	ea.	25315


25008

Low-Pressure Slip-On Inlet Filter for Mobile Phase Reservoir

A type 316 stainless steel tip with a Tefzel® collar seals to a corrosion-resistant type 316 stainless steel filter element. The slip-on filter easily attaches to the pump inlet line, without the use of wrenches. The universal tip accommodates standard PTFE tubing inner diameters. The cylindrical filter is standard 10 µm porosity. ⅛" OD. Fits Altex, ISCO, LDC, Varian, Waters, PerkinElmer, and other pumps.

Description	qty.	cat.#
Slip-On Inlet Filter	ea.	25008

Mobile Phase Sparge Filters

The sparge filter is an inexpensive way to prepare and maintain mobile phases free of dissolved gas. Filters are made from 316 stainless steel and PEEK, and they are compatible with most solvents.


25311

Description	qty.	cat.#
Mobile Phase Sparge Filter, 2 µm	ea.	25311
Mobile Phase Sparge Filter, 10 µm	ea.	25312
Mobile Phase Sparge Filter, 20 µm	ea.	25313

UHP Pulse Dampener

UHPLC compatible

The UHP pulse dampener provides minimal flow pulsation at system pressures up to 18,000 psi. Its low dead volume (220 µL at atmospheric pressure) reduces overall system volume for UHP applications. The UHP pulse dampener has a stainless steel fluid path.


26549

Specifications:

Operating Pressure:	0–18,000 psi
Pulsation Dampening:	3:1 reduction in pulsation (dependent on pump characteristics and system volume and pressure)
Fluid Path Volume:	220 µL (atmospheric pressure)
	+44 µL (per 1,000 psi system pressure)
Wetted Materials:	316 SS; PTFE
Dimensions:	2.5" diameter x 2.0" high

Description	qty.	cat.#
UHP Pulse Dampener	ea.	26549

MiniPulse Pulse Dampener


25238

- Compact unit (2.5" x 1.5") can be placed almost anywhere.
- Small, 160 µL dead volume at atmospheric pressure.
- PEEK unit can withstand pressures to 5,000 psi (34,474 kPa).
- 316 stainless steel unit can withstand pressures to 6,000 psi (41,369 kPa).

Improve system baseline stability while increasing the total system volume by only 160 µL. The MiniPulse pulse dampener is ideal for applications where minimizing the total system volume is critical. Stainless steel and PEEK options for a wide range of applications.

Description	qty.	cat.#
MiniPulse Pulse Dampener, Stainless Steel	ea.	25238
MiniPulse Pulse Dampener, PEEK	ea.	25239

Solvent Debubbler

Bubbles in an LC system can cause check valve malfunctions and pump cavitation, seriously affecting pump performance. The debubbler removes bubbles from the fluid stream before it enters the pump.


25014

Special geometry at the base of the housing allows bubbles entrained in the inlet fluid stream to rise and be trapped in the reservoir. The gas/liquid interface is easily visible through the translucent wall of the device. Loosening the airtight cap releases the trapped gas. The debubbler is fitted with a bracket and universal connecting tips. Accepts 0.063", 0.085", and 0.125" ID tubing.

Description	qty.	cat.#
Solvent Debubbler With Bracket	ea.	25014

Polypropylene
Membrane Filters

KT953825-0000

Membrane Microfiltration Glassware

47 mm filtration apparatus with fritted glass support is recommended for routine filtration of corrosive liquids and removal of particles from LC solvents. The ground joint connection eliminates phthalate contamination that can occur when using silicone or neoprene stoppers. The support base has a coarse-porosity glass frit and an integral vacuum connection, located above the drip tip to prevent contamination of the vacuum line with filtrate droplets. Each apparatus includes a funnel, an anodized aluminum clamp, a 47 mm fritted glass support base, and a filtration flask.

All-Glass Microfiltration Apparatus	qty.	cat.#
300 mL Funnel, 1,000 mL Flask	ea.	KT953825-0000
500 mL Funnel, 2,000 mL Flask	ea.	KT953835-0000
1000 mL Funnel, 4,000 mL Flask	ea.	KT953845-0000
Replacement Parts for Microfiltration Apparatus	**qty.**	**cat.#**
40/35 PTFE Joint Sleeve	6-pk.	KT676001-4035
Flask Cap, 40/35 Outer Joint	ea.	KT953830-0000
Fritted Glass Support, 47 mm, 40/35 Joint	ea.	KT953826-0000
Glass Funnel, 47 mm, 100 mL	ea.	KT953761-0000
Glass Funnel, 47 mm, 300 mL	ea.	KT953751-0000
Glass Funnel, 47 mm, 500 mL	ea.	KT953771-0000
Glass Funnel, 47 mm, 1,000 mL	ea.	KT953781-0000
Flask, 1,000 mL, 40/35 Joint	ea.	KT953827-0000
Flask, 2,000 mL, 40/35 Joint	ea.	KT953828-0000
Flask, 4,000 mL, 40/35 Joint	ea.	KT953829-0000
Aluminum Clamp, 47 mm	ea.	KT953753-0000
Membrane Filters	**qty.**	**cat.#**
Polypropylene Membrane Filters, 47 mm, 0.45 µm	100-pk.	26396
Polypropylene Membrane Filters, 47 mm, 0.22 µm	100-pk.	26397
Nylon Membrane Filters, 47 mm, 0.45 µm	100-pk.	26398
Nylon Membrane Filters, 47 mm, 0.22 µm	100-pk.	26399

Mixers

- Reduced baseline noise.
- Increased sensitivity.
- Improved gradient accuracy for more reproducible results.
- Increased reaction efficiency in post-column derivatization.

An efficient cross-flow shearing mechanism and interchangeable cartridges produce vortex shear mixing over a wide range of flows.

25342

HyperShear Static In-Line Mixers

Stainless steel or PEEK.

	Stainless Steel		PEEK	
Volume	qty.	cat.#	qty.	cat.#
1 µL	ea.	26409	ea.	26410
25 µL	ea.	26411	ea.	26412
50 µL	ea.	25341	ea.	26413
150 µL	ea.	25342	ea.	26414
250 µL	ea.	25343	ea.	26415

25138

Ternary Tee Mixer

Stainless steel.

Description	Volume	qty.	cat.#
Ternary Tee Mixer	25 µL	ea.	25138

Mobile Phase Degasser

Dissolved oxygen can cause flow rate instability and increased baseline noise. Also, it has a quenching effect on fluorescence detection and increases the background of UV detectors. Dissolved gases can out-gas in the LC system, forming bubbles in check valves, at connections, or in detector flow cells.

In-line vacuum degassing is more effective at removing dissolved gas from mobile phases than sonication or helium sparging. In-line degassers work by withdrawing gas across a gas-permeable membrane encased in a sealed chamber. Traditionally, the membrane has been made of PTFE tubing, but the Degasys Ultimate Degasser uses tubing composed of an amorphous fluoropolymer (AF) that is 200 to 300 times more gas permeable than PTFE. This translates into the ability to use shorter tubing for removing dissolved gas. This new material also has better tubular burst strength than PTFE. To prevent cross contamination, each channel on this Degasys unit is individually encased within its own vacuum chamber.

Specifications:

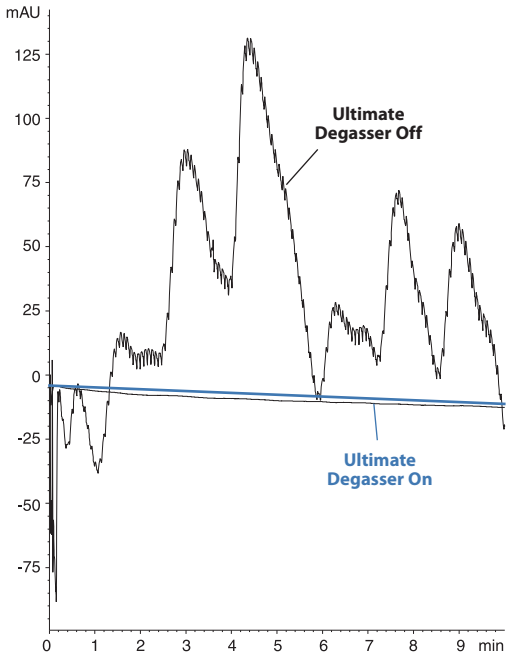
Residual Oxygen[1]	0.9 ppm
Pressure Loss[1]	0.24 psi (1.65 kPa)
Internal Volume	500 µL
Wetted Parts	AF, PTFE, ETFE, PPS
Max Flow Rate	7 mL/min/channel

[1] At a flow rate of 1 mL/min

Description	Voltage	qty.	cat.#
Mobile Phase Degasser (4 Channel, 7 mL/min/channel)	110V	ea.	25189
Mobile Phase Degasser (4 Channel, 7 mL/min/channel)	220V	ea.	25194

To prevent system damage, do not use the Degasys system with solutions containing TFA at concentrations greater than 5%.

Degasys Ultimate Degasser provides highly stable baselines



Mobile Phase: Water:methanol 50:50
Flow: 1.0 mL/min
Detector: UV @ 210 nm

Sidewinder LC Column Heater

- Easy to set up!
- Operation range: 5 °C above ambient to 85 °C, ±1 °C.
- Lightweight, compact design fits in small spaces.
- Column holder can be placed in any orientation.
- Achieve optimum performance and efficiency when used in conjunction with a mobile phase pre-heater.

This unique design completely encloses any LC analytical column up to 25 cm in length. Two lengths of heater jackets are available: the short column holder accommodates columns up to 10 cm in length, while the long column holder holds columns up to 25 cm in length. The control module provides optimum heating performance, accuracy to within 1 °C, and stability to within 0.1 °C. The new Sidewinder controller has fast 10 Hz sampling for improved responsiveness. Power requirements: 24 V control unit for maximum stability. RS232 control allows external programming.

Description	Length	qty.	cat.#
Temperature Control Module and Column Holder	Long (25 cm)	ea.	26516
Temperature Control Module and Column Holder	Short (10 cm)	ea.	26517

All Sidewinder temperature control products carry the globally recognized CE mark. Each unit meets the demanding electromagnetic emission standards of the new European Union Directives, United States standards, and Canadian standards.

Sidewinder LC Heater/Cooler Temperature Control Module and Column Holder

- Operation range: 5–55 °C, ±0.2 °C.
- Ability to program multiple temperature points.
- Accommodates columns up to 30 cm in length and 7.8 mm ID.
- Compact design.
- Achieve optimum performance and efficiency when used in conjunction with a mobile phase pre-heater.

The Sidewinder heater/cooler unit has a doubly insulated cover to maintain the programmed temperature to within 0.2 °C. The 24 V control unit provides maximum stability and rapid equilibration times. RS232 control allows external programming.

Description	qty.	cat.#
Sidewinder Heater/Cooler Temperature Control Module and Column Holder	ea.	26518

All Sidewinder temperature control products carry the globally recognized CE mark. Each unit meets the demanding electromagnetic emission standards of the new European Union Directives, United States standards, and Canadian standards.


26400


26401


26402


26404


26403


26406


26407

Valves for HPLC

Our valves have low internal volumes and are rated to 15,000 psi (103,421 kPa). They feature a two-piece stem assembly in which the rotating upper shank is coupled through a ball joint to a static lower stem. Only fingertight torque is required to make the seal.

Description	qty.	cat.#
Through Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26400
Angle Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26401
Bottom Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26402
Side Vent Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26403
Dual-Stem Three-Way Valve for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	ea.	26404
Prime/Purge Valve for HPLC, 1/4-28 Flanged Seat, Stainless Steel, with Tubing and Fittings	ea.	26406
Prime/Purge Valve Repair Kit for Prime/Purge Valve (includes: soft seal (2), PTFE O-ring (2), 7/32 hex key)	kit	26407


26405


26417

In-Line Check Valves

- Self-priming cartridge valve restricts flow to one direction.
- Prevents fluids from backflowing into column after a pump failure.
- Low flow resistance and low internal volume for rapid closure.
- Operates independently of gravity.
- Protected from contamination by ¼" diameter 2 µm frit.
- Crush-proof construction.

Description	Max Pressure	qty.	cat.#
Check Valve, Soft Seat, for HPLC, 1/16" Fittings, 1/4-28, Stainless Steel, Includes Nuts and Ferrules	15,000 psi	ea.	26405
Check Valve With 1/8" Ball Cartridge, 48 µL Internal Volume	15,000 psi	ea.	26417
Check Valve Replacement 1/8" Ball Cartridge, 48 µL Internal Volume	15,000 psi	ea.	26418
UHP Check Valve With 1/8" Ball Cartridge, 48 µL Internal Volume	30,000 psi	ea.	26419
UHP Check Valve Replacement 1/8" Ball Cartridge, 48 µL Internal Volume	30,000 psi	ea.	26420
Check Valve With 3/16" Ball Cartridge, 60 µL Internal Volume	15,000 psi	ea.	26421
Check Valve Replacement 3/16" Ball Cartridge, 60 µL Internal Volume	15,000 psi	ea.	26422


25017


25020

25018

Backpressure Regulators

Backpressure regulators can improve detector performance by preventing bubble formation in the detector flow cell. They also are useful in post-column reaction lines and between detectors and fraction collectors in preparatory work. Regulators are superior to more specific alternative solutions, like small-bore tubing, in which pressure varies with flow rate.

Our end-of-line and flow-through backpressure regulators are adjustable to ensure constant backpressure over a wide range of mobile phase viscosities and flow rates. The end-of-line model is available with 1/4-28 plastic flange-type fittings or high-pressure 1/16-inch compression fittings; this design adjusts from 15 to 60 psi (103 to 414 kPa). The flow-through design has 1/16-inch compression fittings and is adjustable from 7 to 75 psi (48 to 517 kPa).

Description	qty.	cat.#
Backpressure Regulator: end-of-line, 1/16-inch OD tubing, flanged	ea.	25017
Backpressure Regulator: end-of-line, high-pressure seat	ea.	25018
Backpressure Regulator: flow-through, 5 µL internal volume	ea.	25020

Parker Balston® Nitrogen Gas Generators for LC-MS

- Turn compressed air into ultra-pure nitrogen (up to 99.5%).
- Flows from 1 to 44 L/min.
- Models N2-04, N2-14, N2-22, and N2-35 require no electricity.
- Safe, reliable, low maintenance.
- Maintenance kits include replacement filters.


CE 22130


CE 22129

Specifications	NitroFlow Lab	N2-04	N2-14 or N2-14A	N2-22 or N2-22A	N2-35 or N2-35A
Maximum Nitrogen Flow Rate:	32 L/min	8 L/min	36 L/min max. flow	N2-22: 44 L/min N2-22A: 29 L/min	44 L/min
Nitrogen Purity:	99.50%	99%	95.0%–99.5%	99%	99%
Min/Max Inlet Pressure:	N/A	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig	60 psig/145 psig
Electrical Requirements:	120 VAC/60 Hz	None	N2-14: None N2-14A: 120 VAC/ 60Hz	N2-22: None N2-22A: 120 VAC/60 Hz	N2-35: None N2-35A: 120 VAC/60 Hz
Dimensions:	27.6" h x 35.4" w x 12.2" d (70 cm x 90 cm x 31 cm)	11" h x 13" w x 16" d (27 cm x 34 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)	50" h x 16" w x 16" d (127 cm x 41 cm x 41 cm)
Shipping Weight:	205 lb (93 kg)	43 lb (20 kg)	N2-14: 75 lb (34 kg) N2-14A: 80 lb (36 kg)	N2-22: 101 lb (46 kg) N2-22A: 106 lb (48 kg)	N2-35: 115 lb (52 kg) N2-35A: 119 lb (54 kg)

Nitrogen Generators for LC-MS	Model #	qty.	cat.#
Nitrogen Generator for LC-MS	NitroFlow Lab Model, 32 L/min max. flow	ea.	22129
Nitrogen Generator for LC-MS	N2-04 Model for ELSD, 8 L/min max. flow	ea.	22130
Nitrogen Generator for LC-MS	N2-14 (general purpose) 36 L/min max. flow	ea.	20677
Nitrogen Generator for LC-MS	N2-14 with European Power Cord	ea.	20677-551
Nitrogen Generator for LC-MS	N2-14A (general purpose w/oxygen analyzer) 36 L/min max. flow	ea.	21652
Nitrogen Generator for LC-MS	N2-22 Model, 44 L/min max. flow	ea.	22131
Nitrogen Generator for LC-MS	N2-22A Model, 29 L/min max. flow	ea.	22132
Nitrogen Generator for LC-MS	N2-35 Model, 44 L/min max. flow	ea.	22133
Nitrogen Generator for LC-MS	N2-35A Model, 44 L/min max. flow	ea.	22134
Maintenance Kits	**Model #**	**qty.**	**cat.#**
Maintenance Kit	for N2-14, N2-14A, 75-72, 75-720NA	kit	21648
Maintenance Kit With Carbon Filter	for N2-14, N2-14A, 75-72, 75-720NA	ea.	22135


CE 20677

International power cords are available. Contact Customer Service or your Restek representative to order.

Restek Super-Clean Gas Trapping System for LC-MS

A Super-Clean quick-change cartridge system efficiently removes hydrocarbons from nitrogen!

- Changing filters is quick and easy.
- Up to 20 L of hydrocarbon-free nitrogen per minute.
- Filters connected in parallel to handle high flows for LC-MS.

The Super-Clean Gas Trapping System purifies nitrogen and is ideal for use in LC-MS systems. The two-position base plate (installed in the gas line) allows cartridges to be exchanged without introducing impurities into the system. Spring-loaded check valves seal when a cartridge is removed and open only when a new cartridge has been locked in place. There is no need for loosening and tightening fittings every time you change cartridges, and your system cannot become contaminated during the changing process.

To meet the high flow needs of the LC-MS system, the activated charcoal–filled cartridges are positioned and connected in parallel. The incoming gas stream is split equally between the cartridges, and the two streams are rejoined after purification but before the gas exits the base plate. This approach allows longer contact between the nitrogen and the adsorbent, ensuring higher gas purity and eliminating a potential source of contaminants to your analyses.

A handy date wheel, included with the system, indicates the cartridge installation date and the recommended replacement date.

Description	qty.	cat.#
Super-Clean Gas-Trapping System (2-position base plate, 2 charcoal filters)	ea.	22062
Replacement Hydrocarbon (Charcoal) Filters	2-pk.	22061
Particle Drop-In Filter, 0.5 µm	2-pk.	22367

Super-Clean gas filters provide high-purity outlet gas	
Type of filter:	Hydrocarbon (charcoal)
Max. Flow:	20 L/min
Outlet Gas Quality %:	99.9999%
Maximum Pressure:	11 bar/159 psi
Estimated Lifetime:	3 to 6 months

22292

Syringe for Hitachi LC Autosamplers

SGE

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#
500 µL, M10 X1 Thread	500C-HITACH1	007660	ea.	22292

Syringes for PerkinElmer LC Autosamplers

22297

SGE

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#
100 µL, 1/4-28 UNF Thread	100D-CX-GT	005990	ea.	22296
250 µL, 1/4-28 UNF Thread	250D-CX-GT	006995	ea.	22297
500 µL, 1/4-28 UNF Thread	500D-CX-GT	007995	ea.	22298
1 mL, 1/4-28 UNF Thread	1MD-C-GT	008185	ea.	22299

Syringe for Waters WISP LC Autosamplers

PTFE-tipped plungers

24528

Hamilton

Volume	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
25 µL, 1/4-28 UNF Thread	1702	80020	ea.	24528
250 µL, 1/4-28 UNF Thread	1725	80024	ea.	24529

22294

SGE

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#
25 µL, 1/4-28 UNF Thread	25D-WISP	003990	ea.	22293
250 µL, 1/4-28 UNF Thread	250D-WISP	006690	ea.	22294

Syringes for CTC LC Autosamplers

22746

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	N	22s	2"/51 mm	3	701N	203073	ea.	22743
25 µL	N	22s	2"/51 mm	3	1702N	203075	ea.	22744
100 µL	N	22s	2"/51 mm	3	1710N Slim Line*	203077	ea.	22745
100 µL	N	22	2"/51 mm	3	1710N	203235	ea.	22746
250 µL	N	22	2"/51 mm	3	1725N	203079	ea.	22747
500 µL	N	22	2"/51 mm	3	1750N	203349	ea.	22748

*Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.

22737

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	F	22s	2"/51 mm	LC	10F-CTC-LC	002710	ea.	22737
100 µL*	R	22s	2"/51 mm	LC	100R-C/T-GT-LC	005330	ea.	22741
500 µL*	F	22s	2"/51 mm	LC	500F-CTC-GT-LC(0.41)	007720	ea.	22742

*Gas-tight syringe.

Guide to Needle Termination Codes

Hamilton:

(N) Cemented Needle

SGE:

(F) Fixed Needle

(R) Removable Needle

Economical Microliter Liquid-Type Syringes for Rheodyne® & Valco® Valves

- Cemented/fixed needles.
- Plungers and barrels are not interchangeable or replaceable.


21252

Hamilton

Volume	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	22s	2"	3	701	80365	ea.	21250
25 µL	22s	2"	3	702	80465	ea.	21251
50 µL	22s	2"	3	705	80565	ea.	21252
100 µL	22s	2"	3	710	80665	ea.	21253
250 µL	22s	2"	3	725	80765	ea.	21254

SGE

Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	22	2"	3	10F-LC	002301	ea.	24860
25 µL	22	2"	3	25F-LC	003300	ea.	24861
50 µL	22	2"	3	50F-LC	004300	ea.	24862
100 µL	22	2"	3	100F-LC	005300	ea.	24863
250 µL	22	2"	3	250F-LC	006300	ea.	24864
500 µL	22	2"	3	500F-LC	007300	ea.	24865


24860

Gas-Tight Syringes for Rheodyne® & Valco® Valves

- PTFE-tipped plungers.
- Removable needles.
- Replaceable syringe barrels, plungers, and plunger tips.


21260

Hamilton

Volume	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	26s	2"/51 mm	3	1701	80065	ea.	21260
25 µL	22s	2"/51 mm	3	1702	80265	ea.	21261
50 µL	22s	2"/51 mm	3	1705	80965	ea.	21262
100 µL	22s	2"/51 mm	3	1710	81065	ea.	21263
250 µL	22s	2"/51 mm	3	1725	81165	ea.	21264

SGE

Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	22	2"	3	10R-GT-LC	002313	ea.	24866
25 µL	22	2"	3	25R-GT-LC	003312	ea.	24867
50 µL	22	2"	3	50R-GT-LC	004312	ea.	24868
100 µL	22	2"	3	100R-GT-LC	005312	ea.	24869
250 µL	22	2"	3	250R-GT-LC	006312	ea.	24870
500 µL	22	2"	3	500R-GT-LC	007312	ea.	24871


24868

Replacement Needles for Gas-Tight Syringes for Rheodyne® & Valco® Valves


24941

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5–100 µL	22s	2"	3	7770-01	6-pk.	24941
250 µL–10 mL	22	2"	3	7780-04	6-pk.	24945


24808

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
10 µL	22	2"	3	037250	5-pk.	24808
25–500 µL	22	2"	3	038250	5-pk.	24809


21257

Syringes for Waters U6K Valves

- Reinforced plungers.
- Removable needles.
- Replaceable plunger/barrel assemblies.
- Barrel stop prevents plunger blowout.

Hamilton

Volume	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	25s	1.97"	3	801	84815	ea.	21255
25 µL	25s	1.97"	3	802	84816	ea.	21256
50 µL	25s	1.97"	3	805	84817	ea.	21257
100 µL	25s	1.97"	3	810	84818	ea.	21258
250 µL	25s	1.97"	3	825	84819	ea.	21259


21270

Replacement Needles for Syringes for Waters U6K Valves

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
10–100 µL	25s	1.97"	3	8647-01	6-pk.	21270
250 µL–10 mL	25s	1.97"	3	8648-01	6-pk.	21271


21265

Priming Syringe for Waters 6000, 6000A, 501, 510, 590, 610, and 610E HPLC Pumps

- Designed for maximum safety with metal flange and luer-lock hub.
- PTFE-tipped plunger.

Hamilton

Volume	Hamilton Model	Hamilton cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	1010W	81610	700 psig	ea.	21265


24759

SGE

Volume	SGE Model	SGE cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	10MDR-LL-GT	008960	100 psig	ea.	24759

*Needles sold separately.


Patent No. 7,790,117

Thomson SINGLE StEP™ Filter Vials

- Fast and easy to use—only hand depression force is required.
- Compatible with both UHPLC and standard HPLC autosamplers.
- Pre-slit caps are color coded for easy identification of membrane and porosity.
- Low dead volume unit contains rugged polypropylene insert with 450 µL loading capacity.

See **page 387**.

www.restek.com/**singlestep**

Restek Pack in a Box Kit

Restek's Pack in a Box Kit is a complete column-packing system. Everything you need to pack your own analytical HPLC columns is included: pump, 20 mL reservoir, column hardware (two, 150 x 4.6 mm), and system control software (computer not included). Detailed packing instructions and a DVD also are included. The packing pump is electric, so no pressurized air is required. AC input requirement: 85–265 VAC. 10,000 psi maximum pressure.

Description	qty.	cat.#
Pack in a Box Kit	kit	26408

Bio-Safe Column System (PEEK)

- Completely biocompatible.
- 100% metal free.
- Stable to 8,000 psi.

Bio-Safe columns are biocompatible and precision-machined from virgin PEEK (polyetheretherketone), a strong, inert polymer material.

Product Specs
- 4.6 mm ID x 30 mm length column with end fittings.
- 2.0 µm frits.

Description	qty.	cat.#
Bio-Safe Column System, PEEK, 4.6 mm x 30 mm, 2.0 µm	ea.	26546

HPLC Column Tubing

Restek tubing is manufactured from fine, chromatographic-grade 316 stainless steel. It is corrosion resistant, ultrasonically cleaned, and passivated. We polish the tubing and promise a burr-free cut. You can use this tubing immediately—there is no need for additional treatment.

	2.1 mm ID	3.2 mm ID	4.6 mm ID
Length	cat.#	cat.#	cat.#
1/4" OD Tubing			
30 mm	25100	25106	25112
50 mm	25101	25107	25113
100 mm	25102	25108	25114
150 mm	25103	25109	25115
200 mm	25104	25110	25116
250 mm	25105	25111	25117

Empty Chromatography Columns

- 316 stainless steel tubing complete with end-fittings, frits, nuts, and ferrules.
- Preassembled prior to shipment, unless otherwise requested.
- Internal 1/16-inch seats are compatible with Valco® and Parker fittings.

	2.1 mm ID	3.2 mm ID	4.6 mm ID
Length	cat.#	cat.#	cat.#
1/4" OD Tubing			
30 mm	25118	25124	25130
50 mm	25119	25125	25131
100 mm	25120	25126	25132
150 mm	25121	25127	25133
200 mm	25122	25128	25134
250 mm	25123	25129	25135

Column End-Fittings

- Fittings with distribution cone are intended for use on 3.0–4.6 mm ID HPLC columns.
- Fittings with flat bottom are intended for use on 1.0–3.0 mm ID HPLC columns.

1/4-inch compression end-fittings are compatible with 1/16-inch connecting tubing using Valco® and Parker fittings.

Description	qty.	cat.#
Column End-Fitting with Distribution Cone	ea.	25077
Column End-Fitting with Flat Bottom	ea.	25078

Packing particle size:	Use this pore size:
3–4 µm:	0.5 µm
5–20 µm:	2.0 µm

1/4-Inch HPLC Frits

We manufacture our frits from fine, chromatographic-grade 316 stainless steel, and we offer sizes to fit most column and pore sizes. To choose the correct frit, check its pore size compatibility with the particle size of the packing in the column. If the packing has a smaller particle size than the pore size of the frit, the packing can clog the frit.

ID	Pore Size	qty.	cat.#
4.6 mm	2.0 µm	10-pk.	25071
4.6 mm	0.5 µm	10-pk.	25072
3.2 mm	2.0 µm	10-pk.	25073
3.2 mm	0.5 µm	10-pk.	25074
2.1 mm	2.0 µm	10-pk.	25075
2.1 mm	0.5 µm	10-pk.	25076

Vials & Syringes

Vials

Syringes

Vials

Siltek® Coated Vials

For a highly inert surface, we recommend Siltek® deactivation for your vials.

- Maximizes inertness, minimizes sample breakdown—ideal for difficult matrices and reactive compounds.
- Inert over a wide sample pH range.
- Low bleed.
- Thermally stable.

Siltek® deactivation produces a highly inert glass surface that features high temperature stability, extreme durability, and low bleed. Try Siltek® deactivated vials for better recovery of sample analytes.

For Siltek® vials, add the corresponding suffix number to the vial catalog number.

Qty.	Siltek Deactivation	
100-pk.	-222	addl. cost
1,000-pk.	-223	addl. cost

Septum Selection Guide

Materials	Compatibility	Incompatibility	Resealability	Max. Temp.
Red Rubber (synthetic)	acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	90 °C
PTFE/ Natural Rubber	PTFE: resistance until punctured Rubber: acetone, ACN, alcohols, diethylamine, DMF, DMSO, phenol	aromatics, carbon disulfide, chlorinated solvents, hydrocarbon solvents	very good	90 °C
PTFE/Silicone PTFE/Silicone/PTFE	PTFE: resistance until punctured Silicone: acetone, alcohols, DMF, DMSO, ether	ACN, benzene, chloroform, heptane, hexane, pyridine, THF, toluene	very good	205 °C
Polyethylene	Good resistance to solvents and weak acids or bases. Unreactive with most chemicals, but some solvents cause softening or swelling.	hydrocarbon solvents	one-time use	175 °C
Gray Chlorobutyl	acids or bases, water solutions, buffer solutions, oxygenated solvents, vegetable oils	aliphatic or aromatic hydrocarbons, halogenated solvents, mineral oils, strong acids	very good	100 °C

Abbreviations: ACN = acetonitrile, DMF = dimethylformamide, DMSO = dimethylsulfoxide, THF = tetrahydrofuran
NOTE: This chemical resistance chart is intended only as a guideline. It does not cover all compounds or all solvents. Tests were done at room temperature on pure, single solvents, and there is no data on solvent combinations. Always confirm the compatibility of your vial, closure, and chemical combination prior to sample preparations.

Instrument Reference Chart

Manufacturer	Instrument/Model #	11 mm Crimp-Top	9 mm Short Cap Screw-Thread	Headspace	8 mm Screw-Thread	10 mm Screw-Thread	4 mL WISP 48 Style	1 mL WISP 96 Style
A.I.M.	CPS-100, 200	x			x			
A.I.	42 Vial Tray	x						
A.I.	Headspace (HS: 10, 20 mL)			x				
Agilent	1042, 1050, 1080, 1082, 1084, 1090, 1100, 5890, 6850, 6890, 7670A, 7671A, 7672, 7673A/B, 7683, 7890, 8042	x	x					
Agilent	Headspace (HS: 6, 10, 20 mL, Flat)			x				
Alcott	738	x			x	x		
Alltech	570	x			x	x		
Alltech	580 (standard tray)	x						
Altex		x				x		
AMS	42	x						
Antek	736 Unisampler, 738	x						
ASC		x			x	x		
Beckman	501, 502, 507				x	x		
Bruker	LC 51						x	
Bruker/Varian	8100/8200	x	x		x	x		
Bruker/Varian	Marathon	x	x					
Bruker/Varian	8035, 8000 Series, 8055, 8085, 3800 GC				x			
Bruker/Varian	9100/9090/9095	x			x			
Bruker/Varian	Genesis (HS: 10, 20 mL Rounded)			x				
Bruker/Varian/Rainin	Dynamax AI-IA, AI-200, Dynamax AI-3	x						
Bruker/Varian/Rainin	Dynamax AI-3AI-IA, AI-2W				x			
Carlo Erba/Fisons	42 vial tray AS 800	x						
Carlo Erba/Fisons	AS 800		x					
Carlo Erba/Fisons	AS 800, 8000				x			
Carlo Erba	HS 500, HS 800 (HS: 6, 10, 20 mL, Flat)			x				
Carnegie	CMA-250/200	x						
Chrompack	CP 9000 GC Series	x						
Cueni	Headspace (HS: 10, 20 mL)			x				
CTC	CTC A105S	x						
CTC	Headspace (HS: 20 mL, Flat)			x				
Dani	ALS 39.80, 86.80	x	x		x			
Dani	HSS 39.50, HSS 86.50 (HS: 10, 20 mL)			x				
Dani	SPT 37.50 (HS: 20 mL)			x				
Delsi		x						
Dynatech	42 vial tray	x	x		x			
Dynatech	LC2000		x					
Fisons	42 vial tray, AS800	x						
GBC		x						
Gerstel		x						
Gilson	231 XL, 232 XL, 233 XL, Aspec XL	x	x		x			
Gilson	Asted XL	x			x			
Gynkotek	Gina, others	x			x			
Hitachi	AS-2000, AS-6000	x	x					
Hitachi	S6551				x			
Hitachi	L-7200				x		x	x
Hitachi	L-7250				x		x	
IBM		x			x			
ICI	other than LC 1600	x			x			
Infochroma		x			x			
Jasco	851-AS, AS-950	x			x			
Jasco	LC800 & 900 series				x			
Kipp		x			x			
Kontron	360	x			x			
Kontron	460				x			
LDC	Marathon, Promis	x	x		x			
LDC	other than 713	x			x			
L.E.A.P. Technologies	CTC A105S	x						
L.E.A.P. Technologies	CTC A200S	x	x		x	x		
L.E.A.P. Technologies	HS 500 (HS: 10, 20 mL Rounded)			x				
Magnus Scientific		x			x			
PerkinElmer	AI-1	x	x					
PerkinElmer	Autosystem GC (HS: 10, 20 mL, Rounded)	x		x	x			
PerkinElmer	F40, F45, HS 6, HS 40 (HS: 10, 20 mL, Rounded)			x				
PerkinElmer	Integral 4000 (HS: 10, 20 mL, Rounded)	x		x				
PerkinElmer	ISS 100, LC 600 42 vial tray	x	x					
PerkinElmer	ISS 200 (HS: 6 mL)	x	x	x				
PerkinElmer	420/B, 4900	x			x			
Pharmacia LKB	2157-010	x			x			
Phillips	4247, 4710	x			x			
Phillips	LC-XP	x			x		x	
Polymer-Labs	GPC 110/210	x						
Precision Sampling	GC111, GC 311, LC 241-60	x			x			
Pye	LCXP	x						
S.G.E.	M280D	x			x			
Sedere		x			x			
Shimadzu	AOC 20i	x				x		
Shimadzu	AOC-14/1400, AOC-17				x		x	
Shimadzu	AOC-8B/9, SIL-6A, SIL-6B, -9A, -8A				x			
Shimadzu	HSS-2B (HS: 27 mL)			x				
Shimadzu	SIL-2AS						x	
Shimadzu	SIL-10A, 10Ai, 10AxL	x	x		x	x		
Siemens	AS 32, AS 200	x						
Spark Holland	SPH 125	x	x					
Spark Holland	Marathon, Promis	x	x		x			
Spark Holland	Triathlon, Midas	x			x			
Spectra-Physics	8875, 8880	x	x		x			
Talbot		x			x			
Tekmar	7000, 7000/7050 (HS: 10, 20 mL, Rounded)			x				
Thermo Scientific	TRACE GC 2000, AS2000	x	x					
TOA	ICA5450				x			
Tosca 1		x						
TosoHaas	TSK-6080, AS-8010, AS-8020	x			x		x	
Tracor	770, 771, 772	x						
TSP	8875, 8880, AS 100/1000, AS 300/3000	x			x			
Unicam	4710	x						
Unicam	4700LC				x			
Unicam	4247	x			x			
Unicam	LC-XP	x			x		x	
United Technologies		x			x			
Waters	Alliance 2690	x	x		x	x		
Waters	710, 717+						x	x
Waters	48-pos. M700						x	
Waters	96-pos. M700							x

Vial Size Quick Reference Chart

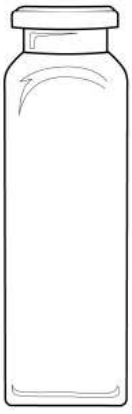
All vials pictured are actual size, with description, Restek catalog number, and page number for quick reference.

WISP Vials

4.0 mL Screw-Thread Step Vial

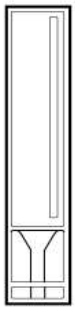
24654, 24655
24656, 24657
Page 343

4.0 mL Clear Crimp-Top



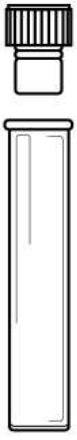
24658, 24659
Page 343

700 µL Limited Volume



24680,
24681
Page 343

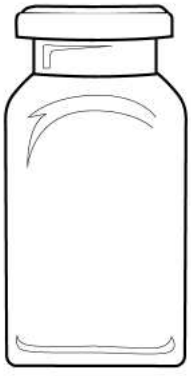
96 Style



24662, 24663,
24664, 24665,
24678, 24679
Page 343

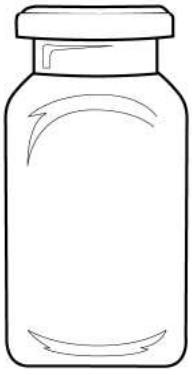
Headspace Vials

10 mL Clear Flat Bottom



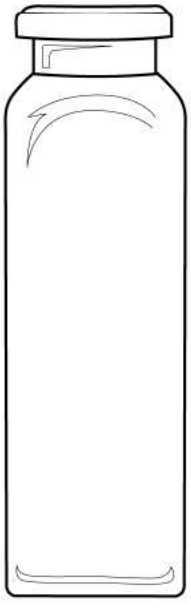
24683,
24684
Page 344

10 mL Clear Rounded Bottom



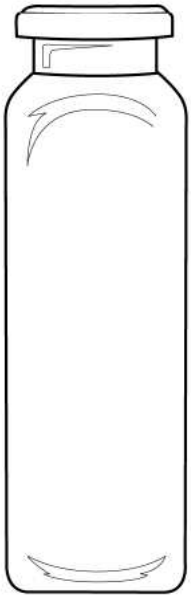
21164,
21165
Page 344

20 mL Clear Flat Bottom



24685,
24686
Page 344

20 mL Clear Rounded Bottom



21162,
21163
Page 344

Vial Size Quick Reference Chart

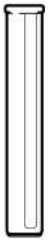
All vials pictured are actual size, with description, Restek catalog number, and page number for quick reference.

Limited Volume Inserts

250 µL Big Mouth Insert

24516, 21779
Page 337

250 µL Glass Flat Bottom



24510
Page 337

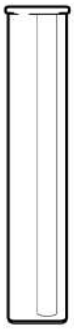
350 µL Glass Flat Bottom Inserts

21780, 24517
Page 337

w/ID Ring

24692, 24693
Page 337

500 µL Glass WISP Flat Bottom



21787, 21788
Page 337

100 µL Glass or Polypropylene w/ Polypropylene Bottom Spring

24508, 21775
24512
Page 337

250 µL Glass or Polypropylene w/ Bottom Spring

21776, 21777, 24518
Page 337

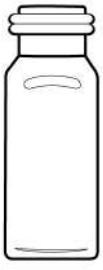
8 mm Screw-Thread Vials

2.0 mL Clear or Amber w/ White Graduated Marking Spot

24619, 24620, 24621, 24622
Page 341

9 mm Short-Cap Vials

2.0 mL Clear or Amber w/White Graduated Marking Spot



21154*, 21155*
*w/out white graduated marking spot
21140, 21141
21142, 21143
Page 340

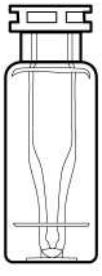
10 mm Screw-Thread Vials

2.0 mL Big Mouth Step Clear or Amber

24626, 24627, 24628, 24629
Page 342

11 mm Crimp-Top Vials

Limited Volume 100 µL Glass Insert, Clear Plastic Vial



24653
Page 338

Limited Volume 100 µL Polypropylene

24651, 24652
Page 338

2.0 mL Snap Seal Style Clear or Amber Glass

21152, 21153, 24383, 24384, 24385, 24386
Page 338

Microsampling Vials and Inserts

Microsampling vials and inserts are ideal for applications where sample volume is limited because they provide maximum sample extraction and minimal sample waste. One-piece interlock vials offer less handling of vial components and reduce the chance of sample loss due to spillage. Limited-volume inserts are designed to work in 2 mL vials.


22437


22439

Interlock Vials

Interlock limited volume vials offer the performance and convenience of a one-piece microvial for a fraction of the cost. A 300 µL insert is fused into a 12 x 32 mm clear or amber glass vial. This one-piece design reduces the potential for contamination.

Description	Type	Volume	Color	Material	100-pk.	500-pk.
Interlock Vial	9 mm Thread	300 µL	Clear	Glass	22433	22434
Interlock Vial	9 mm Thread	300 µL	Amber	Glass	22435	22436
Interlock Vial	11 mm Crimp or Snap Ring	300 µL	Clear	Glass	22437	22438
Interlock Vial	11 mm Crimp or Snap Ring	300 µL	Amber	Glass	22439	22440


21050

21051

Micro-Vials with Screw Threads

- Two sizes available.
- Tapered for high recovery of contents.
- Work with Mininert® sampling valves.

Description	Volume	Screw Thread Size	qty.	cat.#
Micro-Vial, Open Top Cap (attached), Borosilicate Glass, w/Graduated Marking Spot	1.0 mL	13 mm/425	12-pk.	21050
Micro-Vial, Open Top Cap (attached), Borosilicate Glass, w/Graduated Marking Spot	3.0 mL	20 mm/400	12-pk.	21051

also available

Mininert® sampling valves

See **page 346.**

Inserts for 2.0 mL, 11 mm Crimp-Top & 2.0 mL, 9 mm Short-Cap, Screw-Thread Vials

(Vials shown on pages 338 and 340.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	50 µL	Glass	24513	21782
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777
Big Mouth Insert w/Glass Flange (Step Design)*	250 µL	Glass	24516	21779
Insert, Flat Bottom	350 µL	Glass	21780	24517
Insert, Flat Bottom w/ID Ring	350 µL	Glass	24692	24693
Big Mouth Insert w/Bottom Spring	250 µL	Polypropylene	24518	— —
Big Mouth Insert w/Bottom Spring & Graduated Markings	250 µL	Polypropylene	24518A	— —
Big Mouth Insert, Top Flange	250 µL	Polypropylene	24519	— —
Big Mouth Insert, No Spring	250 µL	Polypropylene	24520	— —

*Big Mouth insert w/glass flange (step design) not to be used with 9 mm screw-thread vials.

21776 24516 21780 24692 24518A

Inserts for 2.0 mL, 8 mm Screw-Thread Vials

(Vials shown on page 341.)

Description	Volume	Material	100-pk.	1,000-pk.
Insert w/Polypropylene Bottom Spring	100 µL	Glass	24508	21775
Insert, Flat Bottom	250 µL	Glass	— —	24510
Insert, Flat Bottom w/ID Ring	250 µL	Glass	— —	24691
Insert, No Spring	100 µL	Polypropylene	24511	— —
Insert w/Bottom Spring	100 µL	Polypropylene	24512	— —

24508 24510 24691

also available
Crimpers & Decappers
See **page 347.**

Inserts for 2.0 mL, 10 mm Big Mouth Step Design Screw-Thread Vials

(Vials shown on page 342.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777
Insert, Flat Bottom	350 µL	Glass	21780	24517
Insert, Flat Bottom w/ID Ring	350 µL	Glass	24692	24693
Big Mouth Insert w/Glass Flange (Step Design)	250 µL	Glass	24516	21779

Polypropylene inserts available on request (1,000-packs only).

Inserts for 4.0 mL WISP 48 Screw-Thread Step Vials

(Vials shown on page 343.)

Description	Volume	Material	100-pk.	1,000-pk.
Insert for WISP 48 Vials, Flat Bottom**	500 µL	Glass	21787	21788

Polypropylene inserts available on request (1,000-packs only).
**Also fit 4.0 mL Snap Seal vials. See page 343.

21787

Limited Volume Inserts for Shell Vials, 1.0 mL WISP 96 Style, 8 x 40 mm

(Vials shown on page 343.)

Description	Volume	Material	100-pk.	1,000-pk.
Big Mouth Insert w/Bottom Spring	250 µL	Glass	21776	21777

Versa Vial™ Inserts

(Vials shown on page 345.)

Description	Volume	Material	100-pk.	1,000-pk.
Versa Vial Insert w/Glass Flange	250 µL	Glass	22707	— —
Versa Vial Insert w/Flange	250 µL	Polypropylene	22709	22710
Versa Vial Insert, Flat Bottom	250 µL	Glass	22711	22712

22707

22709

24383

24385

2.0 mL Crimp-Top Vials, 12 x 32 mm, 11 mm

White graduated marking spots are a standard feature unless otherwise noted.

2.0 mL Crimp-Top Vials, 12 x 32 mm, 11 mm

Description	Color	Material	100-pk.	1,000-pk.
Vial w/White Graduated Marking Spot	Clear	Glass	24383	24384
Vial w/White Graduated Marking Spot	Amber	Glass	24385	24386
Vial without Graduated Marking Spot	Clear	Glass	21152	21153

2.0 mL, 11 mm Aluminum Crimp Seals with Septa

Seal Color	Septa Material	100-pk.	500-pk.	1,000-pk.
Silver	PTFE/Natural Rubber	21174	—	21175
Blue	PTFE/Red Rubber	24351	—	24352
Green	PTFE/Red Rubber	24353	—	24354
Red	PTFE/Red Rubber	24355	—	24356
Yellow	PTFE/Red Rubber	24357	—	24358
Mixed	PTFE/Rubber	—	21724	—
Silver	PTFE/Silicone	24359	—	24360
Blue	PTFE/Silicone	24361	—	24362
Green	PTFE/Silicone	24363	—	24364
Red	PTFE/Silicone	24365	—	24366
Yellow	PTFE/Silicone	24367	—	24368
Mixed	PTFE/Silicone	—	21725	—
Silver	PTFE/Silicone/PTFE	24369	—	24370

24673

2.0 mL Crimp Vial Convenience Kits (Vials, Caps, & Septa)

Vials packaged in a clear-lid tray. Caps with septa packaged in a plastic bag.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Deactivated, Silver Seal, PTFE/Natural Rubber Septa	24671	24672
Amber 2.0 mL Vial, Deactivated, Silver Seal, PTFE/Natural Rubber Septa	24673	24674
Clear 2.0 mL Vial, Untreated, Silver Seal, PTFE/Natural Rubber Septa	21196	21197
Amber 2.0 mL Vial, Untreated, Silver Seal, PTFE/Natural Rubber Septa	21198	21199
Clear 2.0 mL Vial, Untreated, Silver Seal, PTFE/Silicone Septa	24646	24647
Amber 2.0 mL Vial, Untreated, Silver Seal, PTFE/Silicone Septa	24648	24649


24651

2.0 mL Crimp-Top Vial with 100 µL Insert

- Plastic vial.
- Choice of glass or polypropylene insert.

Description		100-pk.	1,000-pk.
Clear Plastic Vial	w/100 µL Polypropylene Insert	24651	24652
Clear Plastic Vial	w/100 µL Glass Insert	24653	—

also available

Limited Volume Inserts
for 2.0 mL, 11 mm Crimp-Top Vials

See **page 337.**

2.0 mL, 11 mm Poly Crimp Seal Caps: Snap-on or Crimp

The Poly Crimp seal is versatile, working as either a snap-on or crimp-top cap. Simply use a standard crimping tool to secure the Poly Crimp seal onto any crimp-top vial. It's that easy!

Seal Color	Liner Material	100-pk.	400-pk.	1,000-pk.
Clear	PTFE/Butyl Rubber	24433	—	24434
Clear	PTFE/Silicone	24443	—	24444
Blue	PTFE/Silicone	24445	—	24446
Clear	PTFE/Silicone/PTFE	24453	—	24454
Blue	PTFE/Silicone/PTFE	24455	—	24456
Mixed	PTFE/Silicone/PTFE	—	21728	—

2.0 mL, 11 mm GC Snap Ring Cap with Septum

- Snaps on any crimp-style vial.
- Save money! Use this snap cap when you don't need to crimp.

21731

Description	Liner/Septa Material	100-pk.	1,000-pk.
Polypropylene Snap Ring Cap w/Liner	PTFE, 10 mil	21729	21730
Polypropylene Snap Ring Cap w/Septum	PTFE/Butyl Rubber	21731	21732
Polypropylene Snap Ring Cap w/Septum	PTFE/Silicone	21733	21734

2.0 mL Sample Vial Racks

- Racks feature alphanumeric indexing for easier vial identification.
- Racks can be stacked for efficient storage.
- Fits most 2.0 mL, 12 x 32 mm vials (vials sold separately).

22856

Description	Capacity	qty.	cat.#	qty.	cat.#
Polypropylene Storage Rack for 12 x 32 mm Vials	50 vials, 5 x 10	ea.	22856	5-pk.	22857

also available
Crimpers & Decappers
See **page 347.**


21140

Ideal for Agilent 7673, 7683, 7693 & other autosamplers that process 12 x 32 mm crimp-top vials.

2.0 mL, 9 mm Short-Cap, Screw-Thread Vials, 12 x 32 mm

Fit all 2.0 mL, 12 x 32 mm, crimp-top vial-based autosamplers.

2.0 mL, 9 mm Short-Cap, Screw-Thread Vials (vial only)

Description	Color	100-pk.	1,000-pk.
Short-Cap Vial w/White Graduated Marking Spot	Clear	21140	21141
Short-Cap Vial w/White Graduated Marking Spot	Amber	21142	21143
Short-Cap Vial without Graduated Marking Spot	Clear	21154	21155

2.0 mL, 9 mm Short-Cap, Screw-Vial Closures (Polypropylene, preassembled)

Cap Color	Liner Material	100-pk.		500-pk.		1,000-pk.	
Blue	PTFE/Red Rubber	24473		—	—	24474	
Mixed	PTFE/Red Rubber	—	—	24668	—	—	—
Blue	PTFE/Silicone	24485		—	—	24486	
Green	PTFE/Silicone	24487		—	—	24488	
Yellow	PTFE/Silicone	24493		—	—	24494	
Mixed	PTFE/Silicone	—	—	24669	—	—	—
Blue	PTFE/Silicone/PTFE	24497		—	—	24498	
Black	PTFE/Silicone/PTFE	24495		—	—	24496	
Natural	PTFE/Silicone/PTFE	24501		—	—	24502	
Red	PTFE/Silicone/PTFE	24503		—	—	24504	
Yellow	PTFE/Silicone/PTFE	24505		—	—	24506	
Mixed	PTFE/Silicone/PTFE	—	—	24670	—	—	—

also available

Limited Volume Inserts
for 2.0 mL, 9 mm Short-Cap Screw-Thread Vials

See **page 337.**

also available

Mininert® sampling valves

See **page 346.**

22788


22792

Certified Autosampler Vial Kits

Certified 2.0 mL Screw-Thread Vials

- Certificates enclosed with each kit.
- Vials of clear or amber borosilicate glass, with ID marking spots.
- Closures with pre-inserted septa.
- Each kit sealed for integrity.

Certification Parameters Include:

Vial Dimensions:	height, diameter, bottom thickness, neck length, thread profile, and annealing
Cap/Septum:	diameter, height, thread integrity, center flash, septa insertion, sealing/reseal-ing test, residue by headspace GC, and extractables
Chemical Test:	HPLC Test: nonvolatile residue GC Test: volatile residue

Description	100-pk.
Assembled Clear 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22789
Assembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22788
Unassembled Clear 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Septa	22792
Unassembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Septa	22790
Unassembled Clear 2.0 mL High Recovery Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22793
Unassembled Amber 2.0 mL Vial w/Marking Spot, Cap, Bonded PTFE/Silicone Slit Septa	22791

2.0 mL Screw-Thread Vials, 12 x 32 mm, 8 mm/425 Thread

- Fit all 2.0 mL, 12 x 32 mm, screw-thread 8 mm/425 vial-based autosamplers.

2.0 mL, 8 mm Screw-Thread Vials (vial only)

These vials provide the most secure environment for your sample because evaporation is minimized.

Description	Volume	Color	100-pk.	1,000-pk.
Vial w/White Graduated Marking Spot	2.0 mL	Clear	24619	24620
Vial w/White Graduated Marking Spot	2.0 mL	Amber	24621	24622

2.0 mL, 8 mm Caps and Septa (preassembled)

Cap Color	Septa Material	100-pk.	1,000-pk.
Black	Red PTFE/Silicone, 0.065"	21149	21720
Black Top Hat	PTFE/Silicone	21721	21722

Caps & Septa for 2.0 mL, 8 mm Screw-Thread Vials

Description	Septa Material	100-pk.	1,000-pk.
Black Polypropylene, Open-Hole Caps		21176	21177
Septa, 8 mm x 0.045"	Red PTFE/Silicone	21178	21179
Septa, 8 mm x 0.065"	Red PTFE/White Silicone	21795	21147

All vials undeactivated unless otherwise noted.

2.0 mL Autosampler Vial Convenience Kits

Restek Recommends!

- Vials packaged in a clear-lid tray. Preassembled caps with septa packaged separately in a plastic bag.
- Black polypropylene open-hole caps and 8 mm red PTFE/silicone septa, 0.065".

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Silcote CL7-Deactivated, Black Cap, Red PTFE/Silicone Septa, 0.065"	24638	24639
Amber 2.0 mL Vial, Silcote CL7-Deactivated, Black Cap, Red PTFE/Silicone Septa, 0.065"	24640	24641
Clear 2.0 mL Vial, Untreated, Black Cap, Red PTFE/Silicone Septa, 0.065"	21192	21193
Amber 2.0 mL Vial, Untreated, Black Cap, Red PTFE/Silicone Septa, 0.065"	21194	21195

also available
Limited Volume Inserts
for 2.0 mL, 8 mm Screw-Thread Vials
See **page 337.**

2.0 mL Preassembled Vial Kits

8 mm/425 Screw-Thread, Unmarked Vials, Septa, and Caps

Caps attached to vials.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"*	24630	24631
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.045"*	24632	24633
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"**	24634	24635
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"**	24636	24637

*Best fit for Shimadzu.

**Best fit for Varian.

2.0 mL, 8 mm Screw-Thread Vials with 100 µL Insert

- Plastic vials.
- Choice of glass or polypropylene insert.

Description	Color	100-pk.	1,000-pk.	
Plastic Vial w/100 µL Polypropylene Insert	Clear	24623	24624	
Plastic Vial w/100 µL Glass Insert	Clear*	24625	—	—

*Amber plastic vial with clear glass insert available on request. (1,000-packs only)

24623

2.0 mL Big Mouth Step Design Screw-Thread Vials, 12 x 32 mm, 10 mm/425 Thread

24626

- 40% larger opening than other vials.
- Step profile automatically centers glass flange limited volume inserts.
- Preassembled caps with septa, with or without vials.
- Designed for Waters Alliance® autosamplers.

The Big Mouth Step vial system has a larger ID than conventional vials and incorporates a neck finish that is uniquely designed to allow the insert to be precisely aligned in the center of the vial. This precise alignment provides maximum sample withdrawal and eliminates any chance of missed injections.

2.0 mL Big Mouth Step Screw-Thread Vials (vial only)

Description	Volume	Color	100-pk.	1,000-pk.
Big Mouth Step Vial w/White Graduated Marking Spot	2.0 mL	Clear	24626	24627
Big Mouth Step Vial w/White Graduated Marking Spot	2.0 mL	Amber	24628	24629

24677


21148

Caps and Septa for 2.0 mL Big Mouth Step Vials (preassembled)

Description	Septa Material	1,000-pk.
Caps and Septa, Preassembled	PTFE/Silicone/PTFE, 0.040"	21723
Caps and Septa, Preassembled	Red PTFE/White Silicone, 0.060"	24677

Septa for 2.0 mL Big Mouth Step Vials

Description	Septa Material	qty.	cat.#
Septa Only	Red PTFE/White Silicone, 0.060"	1,000-pk.	21148

also available

Limited Volume Inserts
for 2.0 mL, 10 mm Big Mouth Step Design Screw-Thread Vials

See **page 337.**

2.0 mL Big Mouth Step Vial Kits w/Black Caps (preassembled)

Caps attached to vials.

Description	100-pk.	1,000-pk.
Clear 2.0 mL Vial, Black Cap, PTFE/Silicone/Red PTFE Septa, 0.040"	24675	24676
Clear 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24642	24643
Amber 2.0 mL Vial, Black Cap, Red PTFE/Silicone Septa, 0.065"	24644	24645

4.0 mL WISP 48 Crimp-Top 13 mm Vials, 15 x 45 mm, Snap Seal

4.0 mL WISP 48 Crimp-Top Vial (vial only)

Description	Volume	Color	100-pk.	1,000-pk.
WISP 48 Snap Seal Vial w/White Graduated Marking Spot	4.0 mL	Clear	24658	24659

Aluminum Seals w/Septa for 4.0 mL WISP Crimp-Top Vials

Seal Color	Septa Material	100-pk.	1,000-pk.
Silver	PTFE/Natural Rubber	21753	21754
Silver	PTFE/Silicone	21755	21756

24658

4.0 mL WISP 48 Screw-Thread Step Vials, 15 x 45 mm, 13/425

4.0 mL WISP 48 Screw-Thread Step Vials (vials only)

Description	Volume	Material	100-pk.	1,000-pk.
WISP 48 Step Vial w/White Graduated Marking Spot	4.0 mL	Clear	24654	24655
WISP 48 Step Vial w/White Graduated Marking Spot	4.0 mL	Amber	24656	24657

24654

4.0 mL WISP 48 Caps and Septa

Description	Septa Material	100-pk.	1,000-pk.
WISP 48 Caps and Septa, Top Hat	PTFE/Silicone	21745	21746
WISP 48 Caps and Septa, Preassembled	Red PTFE/Silicone, 0.065"	21743	21744
WISP 48 Caps, Black Polypropylene, Open-Hole		21741	21742
Septa	Red PTFE/Silicone/PTFE, 0.040"	21751	21752
Septa	Red PTFE/Silicone, 0.060"	21749	21750

also available

Limited Volume Inserts
for 4.0 mL WISP 48 Screw-Thread Step Vials and 1.0 mL WISP 96 Style Shell Vials

See **page 337.**

1.0 mL WISP 96 Style Shell Vials, 8 x 40 mm

Available in three styles.

1.0 mL WISP 96 Style, 8 x 40 mm Shell Vials

Description	Volume	Color	Material	200-pk.	1,000-pk.
WISP 96 Style Vial	1.0 mL	Clear	Glass	24662	24663
WISP 96 Style Vial	1.0 mL	Amber	Glass	24664	24665
WISP 96 Style Vial	1.0 mL	Clear	Polypropylene	24678	24679
WISP 96 Style Vial	700 µL Limited Volume	Clear	Polypropylene	24680	24681

8mm Starburst Plugs sold separately.

24662

24664

24678

8 mm Starburst Plugs for Shell Vials, 1.0 mL WISP 96 Style, 8 x 40 mm

Description	Color	Material	200-pk.	1,000-pk.
Starburst Snap Plugs for Shell Vials	Clear	Polyethylene	21769	21770
Starburst Snap Plugs for Shell Vials, Conical	Clear	Polyethylene	21771	21772
Starburst Snap Plugs for Shell Vials, Silicone-Lined	Clear	Polyethylene	21773	21774

24680

Headspace Vials

18 mm Screw-Thread Headspace Vials

Headspace Screw-Thread Vials (18 mm)

Description	Volume	Color	Dimensions	100-pk.	1,000-pk.
Headspace Vial	10 mL	Clear	22 x 45 mm	23084	23085
Headspace Vial	10 mL	Amber	22 x 45 mm	23088	23089
Headspace Vial	20 mL	Clear	22 x 75 mm	23082	23083
Headspace Vial	20 mL	Amber	22 x 75 mm	23086	23087

Caps not included.

23090 23094

Magnetic Screw-Thread Caps (18 mm)

Description	Septa Material	100-pk.	1,000-pk.
Magnetic Caps and Septa	PTFE/Silicone	23090	23091
Magnetic Caps and Septa	PTFE/Silicone for SPME	23092	23093
Magnetic Caps and Septa	PTFE/Red Chlorobutyl	23094	23095

20 mm Headspace Crimp-Top Vials

Headspace Crimp Vials (20 mm)

Description	Volume	Color	Dimensions	100-pk.	1,000-pk.
Headspace Vial	6 mL	Clear	22 x 38 mm	21166	21167
Headspace Vial, Flat Bottom	10 mL	Clear	23 x 48 mm	24683	24684
Headspace Vial, Rounded Bottom	10 mL	Clear	23 x 48 mm	21164	21165
Headspace Vial, Flat Bottom	20 mL	Clear	23 x 75 mm	24685	24686
Headspace Vial, Rounded Bottom	20 mL	Clear	23 x 75 mm	21162	21163
Headspace Vial	27 mL	Clear	30 x 60 mm	21160	21161

Vial to instrument compatibility are designated in instrument reference chart.

21761

Aluminum Seals w/Septa (20 mm, preassembled)

Description	Seal Color	Septa Material	100-pk.	1,000-pk.
Seals w/Septa	Silver	PTFE/Gray Butyl Rubber	21761	21762
Seals w/Septa	Silver	PTFE/Silicone	21763	21764
Pressure Release Seals w/Septa	Silver	PTFE/Gray Butyl Rubber	21765	21766
Pressure Release Seals w/Septa	Silver	PTFE/Silicone	21767	21768

22835

22441

22443

NEW!

Magnetic Seals w/Septa (20 mm, preassembled)

Description	Seal Color	Septa Material	100-pk.	1,000-pk.
Magnetic Seals w/Septa, with 5 mm Hole	Gold	PTFE/Silicone	22833	22834
Magnetic Seals w/Septa, with 8 mm Hole	Gold	PTFE/Silicone	22831	22832
Magnetic Seals w/Septa, with 8 mm Hole	Gold	PTFE/Butyl	22835	22836
BiMetal Magnetic Seals w/Septa, with 8 mm Hole	Red/Silver	PTFE/Silicone	22441	22442
BiMetal Magnetic Seals w/Septa, with 8 mm Hole	Blue/Silver	PTFE/Silicone	22443	22444

5 mm hole is compatible with the following systems: Carlo Erba HS500/HS800, CTC 500, Fisons HS500/HS800, and Bruker/Varian/Chrompack 9020/25. 8 mm hole is compatible with the Combi Pal.

2.0 mL Versa Vials™, Glass, 12 x 32 mm

- Elongated neck allows for consistent, reliable autosampler pick up.
- 9 mm opening is ideal for sampling and pipette use.

Description	Volume	Color	Material	100-pk.	1,000-pk.
Versa Vial	2.0 mL	Clear	Glass	22701	22702
Versa Vial	2.0 mL	Amber	Glass	22697	22698
Versa Vial w/Graduated Marking Spot	2.0 mL	Clear	Glass	22703	22704
Versa Vial w/Graduated Marking Spot	2.0 mL	Amber	Glass	22699	22700

1.5 mL Versa Vials™, Polypropylene, 12 x 32 mm

Description	Volume	Color	Material	100-pk.	1,000-pk.
Versa Vial	1.5 mL	Clear	Polypropylene	22705	22706

also available
Versa Vial™ Inserts
See **page 337.**

Versa Vial™ Plugs (12 mm)

Description	Color	Plug Material	100-pk.	1,000-pk.
Versa Vial Plug	Green	Polyethylene	22713	22714
Versa Vial Plug	Grey	Chlorobutyl/Siliconized	22715	22716
Versa Vial Plug	White	PTFE/Silicone	22717	22718
Versa Vial Plug	White	PTFE/Silicone Plug w/Slit*	22719	22720

*Eliminates needle damage to plug.

Precleaned Volatile Organic Analyte (VOA) Sampling Vials

- Container, liner, and closure cleaned, assembled, and lot traceable.
- Open top caps.
- PTFE faced 0.125" silicone septa.
- Cleaned to U.S. EPA Protocol B specifications.

Description	Volume	Color	Material	Screw-Thread Size	qty.	cat.#
Precleaned VOA Vials	20 mL	Clear	Glass	24 mm/400	72-pk.	21798
Precleaned VOA Vials	20 mL	Amber	Glass	24 mm/400	72-pk.	21799
Precleaned VOA Vials	40 mL	Clear	Glass	24 mm/400	72-pk.	21796
Precleaned VOA Vials	40 mL	Amber	Glass	24 mm/400	72-pk.	21797
Collection Vials for ASE 200	60 mL	Clear	Glass	24 mm/400	72-pk.	26121
Collection Vials for ASE 200	60 mL	Amber	Glass	24 mm/400	72-pk.	26122
Replacement Septa, 24 mm x 0.125"			PTFE-lined silicone		100-pk.	24694

Filter Vials, Sampling Valves for Vials

Simply squeeze particulates and contaminants out of your sample!

Thomson SINGLE StEP™ Filter Vials

Save time and reduce waste—these eco-friendly vials replace syringe filtration and eliminate the need for separate vials, caps, syringes, and filters. Remove contaminants and particulates from your LC samples with just a single squeeze!

- Fast and easy to use—only hand depression force is required.
- Compatible with both UHPLC and standard HPLC autosamplers.
- Pre-slit caps are color coded for easy identification of membrane and porosity.
- Low dead volume unit contains rugged polypropylene insert with 450 µL loading capacity.

23950 23952 23962 23964

23954 23956 23958 23960

Porosity	Color	qty.	cat.#
Nylon			
0.2 µm	black cap	200-pk.	23950
0.2 µm	black cap	500-pk.	23951
0.45 µm	pink cap	200-pk.	23952
0.45 µm	pink cap	500-pk.	23953
PES (polyethersulfone)			
0.2 µm	grey cap	200-pk.	23962
0.2 µm	grey cap	500-pk.	23963
0.45 µm	orange cap	200-pk.	23964
0.45 µm	orange cap	500-pk.	23965
PTFE (polytetrafluoroethylene)			
0.2 µm	green cap	200-pk.	23954
0.2 µm	green cap	500-pk.	23955
0.45 µm	blue cap	200-pk.	23956
0.45 µm	blue cap	500-pk.	23957
PVDF (polyvinyldifluoride)			
0.2 µm	red cap	200-pk.	23958
0.2 µm	red cap	500-pk.	23959
0.45 µm	yellow cap	200-pk.	23960
0.45 µm	yellow cap	500-pk.	23961

Patent No. 7,790,117

24903 24900

24905

Mininert® Precision Sampling Valves for Vials

Mininert® valves are very convenient for repetitive sampling and limit content exposure to the silicon septum. Models are available for screw-cap and crimp-top vials. The crimp-top valve for 20 mm ID glassware slides into the neck of the vial. Turn the threaded flange to secure a tight fit.

Description	Type	Thread Size	qty.	cat.#
Mininert Precision Sampling Valves	Screw-Thread	13 mm/425	12-pk.	24900
Mininert Precision Sampling Valves	Screw-Thread	13 mm/425	12-pk.	24901
Mininert Precision Sampling Valves	Screw-Thread	18 mm/400	12-pk.	24902
Mininert Precision Sampling Valves	Screw-Thread	20 mm/400	12-pk.	24903
Mininert Precision Sampling Valves	Screw-Thread	24 mm/400	12-pk.	24904
Mininert Precision Sampling Valves	Crimp-Top	—	12-pk.	24905
Replacement Septa			50-pk.	24906
Septum Insertion Tool			ea.	24907

Electronic Rechargeable Crimpers and Decappers

- Easy to use; comfortable grip.
- Hundreds of operations from one charge.
- Adjustable crimping force.
- New battery allows for faster charge cycle.
- All kits include a universal plug set for the battery charger.
- For 11 mm and 20 mm caps.
- One-year warranty.

The redesigned electronic crimpers and decappers have a rechargeable 6.4 volt battery installed. The larger battery allows for quick, powerful operation and a faster charge cycle, minimizing downtime. Charging the battery takes thirty minutes to two hours. The universal plug set includes U.S., European, UK, and Australian plug clips.

Description	Size	qty.	cat.#
Electronic Crimper	11 mm	kit	22358
Electronic Crimper	20 mm	kit	22359
Electronic Decapper	11 mm	kit	22360
Electronic Decapper	20 mm	kit	22361
Replacement Battery for Electronic Crimpers and Decappers		ea.	22362

Universal plug set for battery charger included in all kits.

Easy Grip Manual Crimpers and Decappers

Our new Easy Grip crimpers and decappers feature tough, light, glass-filled plastic bodies with curved handles that improve hand comfort during use. The bottom-pull handle allows for a steadier hold than top-push handles. An easily viewed adjustment knob is located at the head of the product. The clearly shown + and – symbols, along with directional arrows, simplify adjusting the intensity of the crimp/decap needed. The knob is also designed to indicate when the crimp setting has been reached, when it fully contacts the body of the product.

Description	Size	qty.	cat.#
Crimper	11 mm	ea.	23396
Decapper	11 mm	ea.	23397
Crimper	20 mm	ea.	23398
Decapper	20 mm	ea.	23399

Safer than removing caps with pliers, knives, or screwdriver blades!

Syringes

did you know?

Syringes and needles manufactured by Hamilton Company and SGE are intended for scientific research and laboratory use only and are not intended for human *in vivo* use.

also available

We can supply many additional sizes. Call us if you don't see exactly what you need.

Syringe Basics

Needle Gauge Chart

Gauge	Nominal OD		Nominal ID	
26s	0.019 in.	0.47 mm	0.0050 in.	0.13 mm
26	0.018 in.	0.46 mm	0.0102 in.	0.26 mm
25	0.021 in.	0.51 mm	0.0102 in.	0.26 mm
23s	0.025 in.	0.64 mm	0.0060 in.	0.15 mm
23	0.025 in.	0.64 mm	0.0132 in.	0.34 mm
22s	0.028 in.	0.72 mm	0.0060 in.	0.15 mm
22	0.028 in.	0.72 mm	0.0162 in.	0.41 mm

s (after gauge) = smaller ID with thicker walls

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Needle Point Style

Restek offers several different point styles on syringe and needle products. Choose one based on your application.

Point Style 2, BV: beveled needle tip. Recommended for optimum septum penetration and prevention of septum coring.

Point Style 3, LC: square/blunt needle tip. For use with HPLC injection valves and for sample pipetting.

Point Style 5, S/Hole, Bevel: conical needle with side hole. Liquid samples are filled and dispensed through the side hole.

Point Style H, Dome: domed needle tip with side hole. Liquid samples are filled and dispensed through the side hole. The solid tip minimizes septum damage.

Point Style Agilent, Cone, AS: special conical style needle point used exclusively on syringes for autosamplers.

Syringe Termination Types

From cemented to removable needles and from PTFE luer lock to special syringe fittings, syringe barrel terminations create the interface between a syringe and its mating connection. For your reference, we describe the most common Hamilton/SGE terminations below.

N, Cemented Needle / F, Fixed:
Needle cemented into the glass syringe barrel at a point corresponding to the zero graduation mark. Not autoclavable.

KH, Knurled Hub / R, Removable:
Used on 7000 series Hamilton syringes, exclusively. Knurled hub enables 6,000 psig maximum injection pressures and the attachment of a spacer for repeatable-depth injections. Autoautoclavable when disassembled.

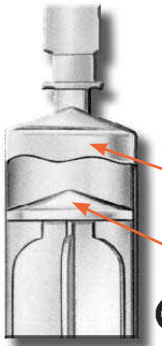
RN, Removable Needle / R, Removable:
Needle seats precisely to the zero graduation mark of the syringe. Allows the use of different specification needles on the same syringe barrel. Autoclavable when disassembled.

TLL, PTFE Luer Lock / LL, Luer Lock / LT, Luer Tip:
Male luer taper with nickel-plated brass hub accepts and locks into place luer hub needles and connectors. Autoclavable when disassembled.

NORM-JECT® Plastic Syringes

NORM-JECT® syringes are latex-free, contain no rubber, no silicone oil, styrene or DEHP, and are DNA-free. These syringes are the choice for any situation needing an inert, nonreactive syringe. Because of their composition, they are ideal for chromatography and many other laboratory procedures. They are more chemically resistant than rubber-tipped syringes and are manufactured from only laboratory grade polypropylene and polyethylene. These unique plastic syringes have a positive safety stop to prevent accidental spills. NORM-JECT® syringes are individually sterile strip packed.

Description	qty.	cat.#
1 mL Luer Slip Tuberculin[1]	100-pk.	22766
3 mL Luer Slip Centric Tip	100-pk.	22767
5 mL Luer Slip Centric Tip[2]	100-pk.	22768
10 mL Luer Slip Eccentric Tip[2]	100-pk.	22769
20 mL Luer Slip Eccentric Tip[2]	100-pk.	22770
30 mL Luer Slip Eccentric Tip	50-pk.	22771
50 mL Luer Slip Eccentric Tip[2]	30-pk.	22772
3 mL Luer Lock Tip	100-pk.	22773
5 mL Luer Lock Tip[2]	100-pk.	22774
10 mL Luer Lock Tip[2]	100-pk.	22775
20 mL Luer Lock Tip[2]	100-pk.	22776
30 mL Luer Lock Tip	50-pk.	22777
50 mL Luer Lock Tip[2]	30-pk.	22778



Great for use with Restek syringe filters!
See page 386.

[1]Dose saver design with low dead space plug on the piston to minimize waste.
[2]The 5 mL has graduations to 6 mL, 10 mL has graduations to 12 mL, 20 mL has graduations to 24 mL, and 50 mL has graduations to 60 mL.

20167

24785

Standard Microliter Syringes for Agilent 7673, 7683, 7693A, and 6850 Autosamplers

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
0.5 µL	ASRN	23s	1.71"	Agilent	7000.5	86276	ea.	24895
0.5 µL	ASRN	26s	1.71"	Agilent	7000.5	86274	ea.	21221
5 µL	ASRN	23s	1.71"	Agilent	75	87957	ea.	20172
5 µL	ASN	23s	1.71"	Agilent	75	87987	ea.	20168
5 µL	ASN	23s	1.71"	Agilent	75	87990	6-pk.	20170
5 µL	ASN	26s	1.71"	Agilent	75	87988	ea.	24592
5 µL	ASN	26s	1.71"	Agilent	75	87989	6-pk.	21230
5 µL	ASRN	23s–26s	1.71"	Agilent	75	87959	ea.	21223
5 µL	ASN	23s–26s	1.71"	Agilent	75	87993	ea.	24593
5 µL	ASN	23s–26s	1.71"	Agilent	75	87994	6-pk.	24594
10 µL	ASRN	23s	1.71"	Agilent	701	80357	ea.	20171
10 µL	ASN	23s	1.71"	Agilent	701	80387	ea.	20167
10 µL	ASN	23s	1.71"	Agilent	701	80390	6-pk.	20169
10 µL	ASRN	26s	1.71"	Agilent	701	80358	ea.	24597
10 µL	ASN	26s	1.71"	Agilent	701	80388	ea.	24595
10 µL	ASN	26s	1.71"	Agilent	701	80389	6-pk.	24599
10 µL	ASRN	23s–26s	1.71"	Agilent	701	80359	ea.	24598
10 µL	ASN	23s–26s	1.71"	Agilent	701	80393	ea.	24596
10 µL	ASN	23s–26s	1.71"	Agilent	701	80391	6-pk.	24600

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	42 mm	Cone	0.5BR-HP-0.63	000410	ea.	24791
0.5 µL	R	26	42 mm	Cone	0.5BR-HP-0.47	000400	ea.	24790
5 µL	R	23	42 mm	Cone	5R-HP-0.63	001815	ea.	24793
5 µL	F	23	42 mm	Cone	5F-HP-0.63	001810	ea.	24781
5 µL	F	23	42 mm	Cone	SK-5F-HP-0.63	001814	6-pk.	24783
5 µL	F	26	42 mm	Cone	5F-HP-0.47	001800	ea.	24780
5 µL	F	26	42 mm	Cone	SK-5F-HP-0.47	001804	6-pk.	24782
5 µL	R	23–26s	42 mm	Cone	5R-HP-0.63/0.47	001825	ea.	21211
5 µL	F	23–26s	42 mm	Cone	5F-HP-0.63/0.47	001821	ea.	21210
5 µL	F	23-26s	42 mm	Cone	SK-5F-HP-0.63/0.47	001822	6-pk.	21214
10 µL	R	23	42 mm	Cone	10R-HP-0.63	002815	ea.	24795
10 µL	F	23	42 mm	Cone	10F-HP-0.63	002810	ea.	24785
10 µL	F	23	42 mm	Cone	SK-10F-HP-0.63	002814	6-pk.	24787
10 µL	R	26	42 mm	Cone	10R-HP-0.47	002805	ea.	24794
10 µL	F	26	42 mm	Cone	10F-HP-0.47	002800	ea.	24784
10 µL	F	26	42 mm	Cone	SK-10F-HP-0.47	002804	6-pk.	24786
10 µL	R	23–26s	42 mm	Cone	10R-HP-0.63/0.47	002825	ea.	21213
10 µL	F	23–26s	42 mm	Cone	10F-HP-0.63/0.47	002821	ea.	21212
10 µL	F	23–26s	42 mm	Cone	SK-10F-HP-0.63/0.47	002822	6-pk.	21215
Large Volume								
25 µL	R	23	42 mm	Cone	25R-HP-0.63	003665	ea.	24798
50 µL	R	23	42 mm	Cone	50R-HP-0.63	004665	ea.	24799
100 µL	R	23	42 mm	Cone	100R-HP-0.63	005665	ea.	24800
250 µL	R	23	42 mm	Cone	250R-HP-0.63	006665	ea.	24801

Gas-Tight PTFE-Tipped Syringes for Agilent 7673, 7683, 7693A, and 6850 Autosamplers

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	ASN	23s	1.71"	Agilent	1701	80080	ea.	24894
10 µL	ASRN	23s	1.71"	Agilent	1701	80087	ea.	21224
10 µL	ASRN	26s	1.71"	Agilent	1701	80088	ea.	21228
10 µL	ASRN	23s–26s	1.71"	Agilent	1701	80089	ea.	21229

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	F	23	42 mm	Cone	10F-HP-GT-0.63	002812	ea.	24789
10 µL	R	23	42 mm	Cone	10R-HP-GT-0.63	002818	ea.	24797
10 µL	R	23–26	42 mm	Cone	10R-HP-GT-0.63/0.47	002829	ea.	21220

24894

24789

Replacement Needles for Agilent 7673, 7683, 7693A, and 6850 Autosampler Syringes

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5–10 µL	23s	1.71"	Agilent	7786-01	6-pk.	20164
5–10 µL	26s	1.71"	Agilent	7786-02	6-pk.	20165
5–10 µL	23s–26s	1.71"	Agilent	7785-01	6-pk.	20166

SGE

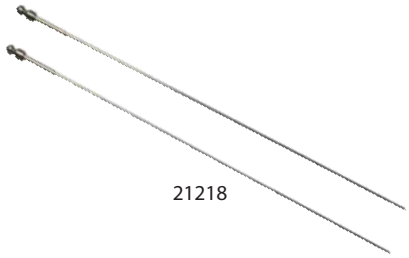
Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	42 mm	Cone	033715	ea.	24821
0.5 µL	26	42 mm	Cone	033708	ea.	24820
5 µL	23	42 mm	Cone	036720	2-pk.	24823
10 µL	23	42 mm	Cone	037717	2-pk.	24825
10 µL	26	42 mm	Cone	037715	2-pk.	24824
25–250 µL	23	42 mm	Cone	038717	2-pk.	24826

Do not reuse PTFE washers.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip



Replacement Plunger Assembly, PTFE-Tipped

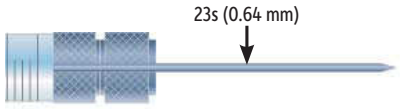
for Agilent 7673, 7683, 7693A, and 6850 Autosampler Syringes

SGE

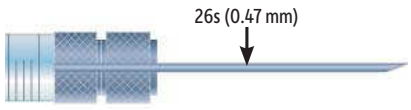
Syringe Volume	Needle Term.	SGE cat.#	qty.	Restek cat.#
10 µL	F	031808	2-pk.	21218
10 µL	R	031809	2-pk.	21284

Needle Gauge for Agilent 7673, 7683, 7693A, and 6850 Syringes

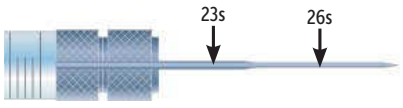
Single Gauge Needle (23s)
- The most popular gauge for Agilent 7673.
- Best for Merlin Microseal septum and standard septum-equipped GCs.
- Packed column injection ports.
- Split/splitless injection ports.



Single Gauge Needle (26s)
- On-column injection ports.
- Split/splitless injection ports.



23s-26s—Dual Gauge (tapered)
- Durability of a 23s gauge needle.
- Ability of a 26s gauge needle to perform split/splitless and on-column injections.



Cross-Reference for Agilent Syringes

Similar to Agilent Part #	Restek Part #	Description	Page
5181-1267	21212, 24596	10 µL Standard Syringe, Fixed Needle, 23-26 Gauge	350
5181-1273	21210, 24593	5 µL Standard Syringe, Fixed Needle, 23-26 Gauge	350
5181-3319	20166	Needle for 10 µL Standard Syringe, 23-26 Gauge	351
5181-3321	21213, 24598	10 µL Standard Syringe, Removable Needle, 23-26 Gauge	350
5181-3356	21218	Replacement PTFE-Tipped Plunger for 10 µL Fixed Needle Syringe	352
5181-3358	24919	PTFE-Tipped Plunger for 10 µL Standard Syringe, Removable Needle	365
5181-3360	21215, 24600	10 µL Standard Syringe, Fixed Needle, 23-26 Gauge (6-pk.)	350
5181-3365	21218	PTFE-Tipped Plunger for 10 µL Standard Syringe, Fixed Needle	352
5181-8809	24894, 24789	10 µL Gas-tight Syringe, Fixed Needle, 23 Gauge	351
5181-8811	20164, 24825	Needle for 10 µL Gas-tight Syringe, 23 Gauge	351
5181-8813	21224, 24797	10 µL Gas-tight Syringe, Removable Needle, 23 Gauge	351
5182-0830	24821	Needle for 0.5 µL Standard Syringe, 23 Gauge	351
5182-0832	20166	Needle for 5-10 µL Autosampler Syringe, 23-26 Gauge	351
5182-0834	20172, 24793	5 µL Standard Syringe, Removable Needle, 23 Gauge	350
5182-0835	21223, 21211	5 µL Standard Syringe, Removable Needle, 23-26 Gauge	350
5182-0875	20170, 24783	5 µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	350
9301-0713	20167, 24785	10 µL Standard Syringe, Fixed Needle, 23 Gauge	350
9301-0714	24595, 24784	10 µL Standard Syringe, Fixed Needle, 26 Gauge	350
9301-0725	20169, 24787	10 µL Standard Syringe, Fixed Needle, 23 Gauge (6-pk.)	350
9301-0891	24592, 24780	5 µL Standard Syringe, Fixed Needle, 26 Gauge	350
9301-0892	20168, 24781	5 µL Standard Syringe, Fixed Needle, 23 Gauge	350

Merlin MicroShot™ Injector

- NIST traceability assures accurate injections.
- Fixed volume reduces sampling error.
- Saves time—no need to transfer to autosampler vials.
- Prevents bent syringe plungers.
- Five injection volumes available.*

Increase the accuracy and reproducibility of manual injections with the Merlin MicroShot™ injector. This new injector is calibrated to NIST reference standards to assure accurate and traceable displacement. Precise repeated injections of the preset volume can be made using a standard autosampler syringe with less variation than when injecting by hand. The trigger mechanism provides rapid sample delivery, which reduces needle residence time in the injection port and minimizes potential sample discrimination.

The Merlin MicroShot™ injector allows convenient sampling from a wide variety of containers, so you can save time by eliminating the need to transfer aliquots into autosampler vials. The design of this unit also includes a plunger support, which protects the syringe plunger and prevents it from bending.

Fits Agilent-style (ball-end plunger) autosampler syringes with either fixed or removable, 23- or 26-gauge needles.

NEW!

22226

Description	Merlin cat.#	qty.	Restek cat.#
0.1 µL injection volume	701-01	ea.	22226
0.2 µL injection volume	701-02	ea.	22227
0.5 µL injection volume	701-05	ea.	22228
1.0 µL injection volume	701-10	ea.	22229
2.0 µL injection volume	701-20	ea.	22230

*Syringe not included. Requires Agilent-style (ball-end plunger) autosampler syringe.

24956

24851

24922

Autosampler Syringes for Bruker/Varian 8000 Series GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
Bruker/Varian 8100/8200 Syringes								
10 µL	RN	26s	1.99"	5	701 Varian	202880	ea.	24956

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
Bruker/Varian 8035, 8100, & 8200 Syringes								
10 µL*	F	25	53 mm	S/Hole	10F-VA8X-11	002923	ea.	24851
10 µL*	R	25	53 mm	S/Hole	10R-VA8X-II	002924	ea.	24852
100 µL	R	25	53 mm	S/Hole	100R-VA8X	005921	ea.	24853
Bruker/Varian CP 8400, CP8410 Syringes								
10 µL	F	26	50 mm	Cone	10F-C/F-5/0.47C	002980	ea.	24922
10 µL	F	26	50 mm	Bevel	10F-VA8400-5/0.47	002950	ea.	21202

*Gas-tight syringe.

24857

Replacement Needles

for Bruker/Varian 8000 Series Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
10 µL	23	53 mm	S/Hole	037779	2-pk.	24857
10 µL*	25	53 mm	S/Hole	037780	ea.	24858
10 µL**	25	53 mm	S/Hole	037777	ea.	24854
10 µL	25	53 mm	2	037776	2-pk.	24855

*Straight needle shaft, 0.20 mm ID needle, for use with viscous samples.
**Tapered needle shaft, 0.12 mm ID needle.

High Dynamic (HD) Headspace Syringes for CTC CombiPAL Autosamplers

- High Dynamic (HD) plunger optimized for higher throughput in the headspace technique.
- Excellent performance over a large range of temperatures and temperature gradients.
- Increased lifetime, as compared to traditional headspace syringes.
- Increased accuracy and reproducibility of headspace GC analysis.

NEW!

26554

NEW!

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
1.0 mL	N	23	2"/51 mm	5	1001	203082	ea.	26552
2.5 mL	N	23	2"/51 mm	5	1002	203084	ea.	26553
5.0 mL	N	23	2"/51 mm	5	1005	203086	ea.	26554
1.0 mL	N	26	2"/51 mm	5	1001	203141	ea.	26555
2.5 mL	N	26	2"/51 mm	5	1002	203181	ea.	26556
5.0 mL	N	26	2"/51 mm	5	1005	203182	ea.	26557

Replacement Plungers

for HD-Type CTC CombiPAL AS Syringes

Hamilton

Volume	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
1.0 mL	1001	207114	ea.	26558
2.5 mL	1002	207115	ea.	26559
5.0 mL	1005	207116	ea.	26560

26560

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

22757

24922

Autosampler Syringes for CTC GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
1.2 µL	N	26	2"/51 mm	AS	7701.2N	203185	ea.	22755
5 µL	N	26s	2"/51 mm	AS	75N	203189	ea.	22756
10 µL	N	23s	2"/51 mm	AS	701N	203361	ea.	22757
10 µL	N	23s-26s	2"/51 mm	AS	701N	203362	ea.	22758
10 µL	N	23s	2"/51 mm	2	701N	203363	ea.	22759
10 µL	N	26s	2"/51 mm	2	701N Slim Line	203072	ea.	22760
10 µL	N	26s	2"/51 mm	AS	701N	203205	ea.	22761
10 µL	N	26s	2"/51 mm	2	701N	203269	6-pk.	22762
25 µL*	N	26s	2"/51 mm	AS	1702N	203043	ea.	22763
25 µL*	N	26s	2"/51 mm	AS	1702N Slim Line**	203074	ea.	22764
100 µL*	N	26s	2"/51 mm	AS	1710N Slim Line**	203076	ea.	22765

Due to collar design, Hamilton syringes may not work with older generation LEAP autosamplers.
*Gas-tight syringe.
**Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	50 mm	Cone	0.5BNR-C/F-0.63	000492	ea.	24928
0.5 µL	R	26	50 mm	Cone	0.5BNR-C/F-0.47	000490	ea.	24926
5 µL	F	23	50 mm	Cone	5F-C/F-5/0.63	001981	ea.	24921
5 µL	F	26	50 mm	Cone	5F-C/F-5/0.47	001982	ea.	24920
10 µL	F	23	50 mm	Cone	10F-VA8400-5/0.63C	002951	ea.	24923
10 µL	R	23	50 mm	Cone	10R-C/F-0.63	002984	ea.	24932
10 µL	F	26	50 mm	Cone	10F-BT-5/0.47C	0029801	ea.	24922
10 µL	F	26	50 mm	Cone	5K-10F-BT-5/0.47C	0029861	6-pk.	24925
10 µL	R	26	50 mm	Cone	10R-VA8400-5/0-0.47C	002952	ea.	24930
10 µL*	F	23	50 mm	Cone	10F-C/T-GT-5/0.63C	0029871	ea.	22749
25 µL	F	26	50 mm	Cone	25F-C/T-5/0.47C	003980	ea.	22750
25 µL*	F	23	50 mm	Cone	25F-C/T-GT-5/0.63C	0039871	ea.	22751
100 µL*	F	23	50 mm	Cone	100F-C/T-GT-5/0.63C	005335	ea.	22753
100 µL*	R	26	50 mm	Cone	100R-C/T-GT-5/0.47C	005333	ea.	22754

*Gas-tight syringe.

24933

Replacement Needles

for CTC Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	50 mm	Cone	033772	ea.	24929
10 µL	23	50 mm	Cone	037787	2-pk.	24933

Autosampler Syringes for PerkinElmer Autosystem and Clarus 500 GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
5 µL	ASN	23	2.756"	3	75ASN/PE	88035	ea.	24953
5 µL	ASN	26	2.756"	3	75ASN/PE	88040	ea.	24952

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	70 mm	Cone	0.5BR-PE-0.63	000478	ea.	24811
0.5 µL	R	26	70 mm	Cone	0.5BR-PE-0.47	000475	ea.	24810
5 µL	F	23	70 mm	Cone	5F-PE-0.63	001954	ea.	24813
5 µL*	F	23	70 mm	Cone	5F-PE-GT-0.63	001957	ea.	24815
5 µL	F	26	70 mm	Cone	5F-PE-0.47	001953	ea.	24812
5 µL*	F	26	70 mm	Cone	5F-PE-GT-0.47	001955	ea.	24814
50 µL	F	23	70 mm	Cone	50F-PE-0.63	004670	ea.	24816

*Gas-tight.

24952

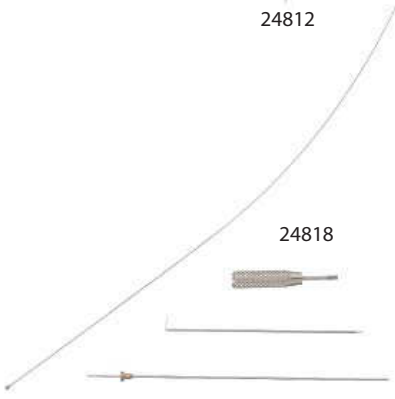
24812

Replacement Needle and Plunger Kit

for PerkinElmer Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	70 mm	Cone	033765	kit	24818
0.5 µL	26	70 mm	Cone	033750	kit	24817



24818

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip


24530


24843

Autosampler Syringes for Shimadzu GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

for Shimadzu AOC 9 GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
5 µL	RN	26s	2"/51 mm	2	75RN	87930	ea.	24617
5 µL	N	26s	2"/51 mm	2	75N	87900	ea.	24938
10 µL	RN	26s	2"/51 mm	2	701RN	80330	ea.	24530

SGE

for Shimadzu AOC 14, 17, 20, and 20i GCs

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	42 mm	Cone	0.5BR-S-0.63	000445	ea.	24841
0.5 µL	R	26	42 mm	Cone	0.5BR-S-0.47	000440	ea.	24840
5 µL	F	23	42 mm	Cone	5F-S-0.63	001988	ea.	24843
5 µL	F	26	42 mm	Cone	5F-S-0.47	001987	ea.	24842
10 µL	R	23	42 mm	Cone	10R-S-0.63	002898	ea.	24845
10 µL*	R	23	42 mm	Cone	10R-S-GT-0.63	002902	ea.	24846
10 µL	R	26	42 mm	Cone	10R-S-0.47	002897	ea.	24844

*Gas-tight syringe.


24749

Replacement Needles

for Shimadzu Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	23	42 mm	Cone	033745	ea.	24747
0.5 µL	26	42 mm	Cone	033738	ea.	24746
10 µL	23	42 mm	Cone	037747	2-pk.	24749
10 µL	26	42 mm	Cone	037745	2-pk.	24748

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

Autosampler Syringes for Thermo Scientific GCs

- Hamilton and SGE syringes are designed and tested to meet critical autosampler performance needs.
- Needle point styles are designed to withstand multiple, rapid injections through a septum.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	25s	2"	2	701SN	80320	ea.	24961
10 µL	N	26s	3.15"	AS	701SN	80318	ea.	24962

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	50 mm	Cone	0.5BNR-C/F-0.63	000492	ea.	24928
0.5 µL	R	26	50 mm	Cone	0.5BNR-C/F-0.47	000490	ea.	24926
10 µL	F	23	50 mm	Cone	10F-VA8400-5/0.63C	002951	ea.	24923
10 µL	R	23	50 mm	Cone	10R-C/F-0.63	002984	ea.	24932
10 µL	F	26	50 mm	Cone	10F-BT-5/0.47C	0029801	ea.	24922
10 µL	F	26	50 mm	Cone	5K-10F-BT-5/0.47C	0029861	6-pk.	24925
10 µL	R	26	50 mm	Cone	10R-VA8400-5/0-0.47C	002952	ea.	24930
10 µL	F	26	80 mm	Cone	10F-C/F-8/0.47C	002992	ea.	24924
10 µL	R	26	80 mm	Cone	10R-C/F-8/0-0.47C	002993	ea.	24934

24962

24924

Replacement Needles

for Thermo Scientific Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
0.5 µL	26	50 mm	Cone	033770	ea.	24927
0.5 µL	23	50 mm	Cone	033772	ea.	24929
10 µL	26	80 mm	Cone	031535	3-pk.	24935
10 µL	23	50 mm	Cone	037787	2-pk.	24933

instrument reference

Autosampler Syringes for Thermo Scientific GCs

Autosampler syringes for TriPlus, AS3000, AS2000, AS200/800 GCs. The following autosamplers are compatible with the respective SGE and Hamilton syringes. For further information or questions, contact your Restek sales representative or technical service.

SGE Syringes

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24928	356, 359
•	•			24926	356, 359
•	•	•	•	24923	356, 359
•	•	•	•	24932	356, 359
•		•		24924	359
•	•	•	•	24934	359
•	•	•	•	24922	356, 359
•	•	•		24930	356, 359

Replacement Needles for SGE Syringes for Thermo Scientific GCs

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
•	•			24929	356, 359
•	•			24927	359
•	•	•	•	24933	356, 359
•	•	•	•	24935	359

Hamilton Syringes

TriPlus	AS3000	AS2000	AS200/800	Restek cat.#	Page
			•	24962	359

Autosampler Syringes

23909

23928

Syringes for Thermo Scientific RSH Autosampler

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
5 µL	F	23	57 mm	Cone	5F-RSH-5.7/0.63C	001861	ea.	23908
5 µL	F	23	85 mm	Cone	5F-RSH-8.5/0.63C	001863	ea.	23909
5 µL	F	26	57 mm	Cone	5F-RSH-5.7/0.47C	001865	ea.	23910
5 µL	F	26	85 mm	Cone	5F-RSH-8.5/0.47C	001867	ea.	23911
5 µL	R	23	57 mm	Cone	5R-RSH-5.7/0.63C	001871	ea.	23912
5 µL	R	23	85 mm	Cone	5R-RSH-8.5/0.63C	001873	ea.	23913
5 µL	R	26	57 mm	Cone	5R-RSH-5.7/0.47C	001875	ea.	23914
5 µL	R	26	85 mm	Cone	5R-RSH-8.5/0.47C	001877	ea.	23915
10 µL	F	23	57 mm	Cone	10F-RSH-5.7/0.63C	002861	ea.	23916
10 µL *	F	23	57 mm	Cone	10F-RSH-GT-5.7/0.63C	002862	ea.	23917
10 µL	F	23	85 mm	Cone	10F-RSH-8.5/0.63C	002863	ea.	23918
10 µL *	F	23	85 mm	Cone	10F-RSH-GT-8.5/0.63C	002864	ea.	23919
10 µL	F	26	57 mm	Cone	10F-RSH-5.7/0.47C	002865	ea.	23920
10 µL *	F	26	57 mm	Cone	10F-RSH-GT-5.7/0.47C	002866	ea.	23921
10 µL	F	26	85 mm	Cone	10F-RSH-8.5/0.47C	002867	ea.	23922
10 µL *	F	26	85 mm	Cone	10F-RSH-GT-8.5/0.47C	002868	ea.	23923
10 µL	R	23	57 mm	Cone	10R-RSH-5.7/0.63C	002871	ea.	23924
10 µL *	R	23	57 mm	Cone	10R-RSH-GT-5.7/0.63C	002872	ea.	23925
10 µL	R	23	85 mm	Cone	10R-RSH-8.5/0.63C	002873	ea.	23926
10 µL *	R	23	85 mm	Cone	10R-RSH-GT-8.5/0.63C	002874	ea.	23927
10 µL	R	26	57 mm	Cone	10R-RSH-5.7/0.47C	002875	ea.	23928
10 µL *	R	26	57 mm	Cone	10R-RSH-GT-5.7/0.47C	002876	ea.	23929
10 µL	R	26	85 mm	Cone	10R-RSH-8.5/0.47C	002877	ea.	23930
10 µL *	R	26	85 mm	Cone	10R-RSH-GT-8.5/0.47C	002878	ea.	23931
25 µL *	F	26	57 mm	Cone	25F-RSH-GT-5.7/0.47C 2	003866	ea.	23932
50 µL *	F	26	57 mm	Cone	50F-RSH-GT-5.7/0.47C	004866	ea.	23933
100 µL *	F	26	57 mm	Cone	100F-RSH-GT-5.7/0.47(0.11)C	005866	ea.	23934
250 µL *	F	26	57 mm	Cone	250F-RSH-GT-5.7/0.47C	006866	ea.	23935

*Gas-tight syringe.

23945

Replacement Needles for Thermo Scientific RSH Autosampler Syringes

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
5 µL	23	57 mm	Cone	N5-RSH-5.7/0.63C 2-pk	036871	2-pk	23942
5 µL	23	85 mm	Cone	N5-RSH-8.5/0.63C 2-pk	036873	2-pk	23943
5 µL	26	57 mm	Cone	N5-RSH-5.7/0.47C 2-pk	036875	2-pk	23944
5 µL	26	85 mm	Cone	N5-RSH-8.5/0.47C 2-pk	036877	2-pk	23945
10 µL	23	57 mm	Cone	N10-RSH-5.7/0.63C 2-pk	037871	2-pk	23946
10 µL	23	85 mm	Cone	N10-RSH-8.5/0.63C 2-pk	037873	2-pk	23947
10 µL	26	57 mm	Cone	N10-RSH-5.7/0.47C 2-pk	037875	2-pk	23948
10 µL	26	85 mm	Cone	N10-RSH-8.5/0.47C 2-pk	037877	2-pk	23949

Replacement Plungers for Thermo Scientific RSH Autosampler Syringes

SGE

Syringe Volume	Needle Term.	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	P10F-RSH-GT	032810	ea.	23936
10 µL	R	P10R-RSH-GT	032811	ea.	23937
25 µL	F	P25F-RSH-GT	032815	ea.	23938
50 µL	F	P50F-RSH-GT	032821	ea.	23939
100 µL	F	P100F-RSH-GT	032825	ea.	23940
250 µL	F	P250F-RSH-GT	032831	ea.	23941

Note: Compatible with Thermo Scientific gas-tight syringes only.

Manual Microliter Syringes

- Economical.
- Available with cemented needles (N/F) or removable needles (RN/R).
- Each syringe plunger and barrel assembly is manufactured as one working unit; components are not interchangeable or individually replaceable.

24532

24703

Hamilton 700 Series

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
5 µL	N	26s	2"/51 mm	2	75N	87900	ea.	24938
5 µL	RN	26s	2"/51 mm	2	75RN	87930	ea.	24617
10 µL	N	26s	2"/51 mm	2	701N	80300	ea.	20174
10 µL	N	26s	2"/51 mm	2	701N	80366	6-pk.	20175
10 µL	RN	26s	2"/51 mm	2	701RN	80330	ea.	24530
25 µL	N	22s	2"/51 mm	2	702N	80400	ea.	24531
10 µL	N	26s	2"/51 mm	5	701NPT5	80339	ea.	24967
25 µL*	RN	22s	2"/51 mm	2	702RN	80430	ea.	24532
50 µL	N	22s	2"/51 mm	2	705N	80500	ea.	24533
50 µL*	RN	22s	2"/51 mm	2	705RN	80530	ea.	24534
100 µL	N	22s	2"/51 mm	2	710N	80600	ea.	24535
100 µL*	RN	22s	2"/51 mm	2	710RN	80630	ea.	24536
250 µL	N	22s	2"/51 mm	2	725N	80700	ea.	24537
250 µL*	RN	22s	2"/51 mm	2	725RN	80730	ea.	24538
500 µL	N	22	2"/51 mm	2	750N	80800	ea.	24539
500 µL*	RN	22	2"/51 mm	2	750RN	80830	ea.	24540

*Replacement RN/R needles available. See page 365.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
5 µL	F	26	50 mm	2	5F**	001000	ea.	24700
5 µL*	R	26	50 mm	2	5R**	001050	ea.	24701
10 µL	F	26	50 mm	2	10F**	002000	ea.	24702
10 µL	F	26	50 mm	2	SK-10F**	002030	6-pk.	24715
10 µL*	R	26	50 mm	2	10R**	002050	ea.	24703
10 µL*	R	26	50 mm	2	SK-10R**	002080	6-pk.	24716
25 µL	F	25	50 mm	2	25F	003000	ea.	24704
25 µL*	R	25	50 mm	2	25R	003050	ea.	24705
50 µL	F	25	50 mm	2	50F	004000	ea.	24706
50 µL*	R	25	50 mm	2	50R	004050	ea.	24707
100 µL	F	25	50 mm	2	100F	005000	ea.	24708
100 µL*	R	25	50 mm	2	100R	005050	ea.	24709
250 µL	F	25	50 mm	2	250F	006000	ea.	24710
250 µL*	R	25	50 mm	2	250R	006050	ea.	24711
500 µL	F	25	50 mm	2	500F	007000	ea.	24712
500 µL*	R	25	50 mm	2	500R	007050	ea.	24713

*Replacement RN/R needles available. See page 365.

**With plunger protection.

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

24723

24542

24769

SuperfleX Flexible Plunger Microliter Syringes

- The SuperfleX syringe features a super-elastic plunger that returns to its original shape if twisted or bent.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
5 µL	F	26	50 mm	2	5FX	001100	ea.	24720
5 µL	R	26	50 mm	2	5RX	001150	ea.	24721
10 µL	F	26	50 mm	2	10FX	002100	ea.	24722
10 µL	F	26	50 mm	2	SK-10FX	002130	6-pk.	24718
10 µL	R	26	50 mm	2	10RX	002150	ea.	24723
10 µL*	R	26	50 mm	2	SK-10RX	002180	6-pk.	24719

Reinforced Plunger Microliter Syringes

- Reinforcing extends the life of fragile, small diameter plungers.
- Economical because of longer life—even in rugged applications.
- Hand-lapped plunger ensures a perfect seal with the barrel.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
5 µL	N	26s	2"/51 mm	2	95	87920	ea.	24541
5 µL*	RN	26s	2"/51 mm	2	95	87925	ea.	24542
10 µL	N	26s	2"/51 mm	2	901	80360	ea.	24543
10 µL*	RN	26s	2"/51 mm	2	901	80370	ea.	24544

*Replacement RN/R needles available. See page 365.

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
5 µL	F	26	50 mm	2	5F-GP	001400	ea.	24769
5 µL*	R	26	50 mm	2	5R-GP	001450	ea.	24766
10 µL	F	26	50 mm	2	10F-GP	002400	ea.	24767
10 µL*	R	26	50 mm	2	10R-GP	002450	ea.	24768

*Replacement RN/R needles available. See page 365.

Micro-Volume, Positive Displacement Syringes

- Sample is contained in the needle with full plunger displacement, ensuring no dead volume.
- High precision and accuracy down to 0.1 µL.
- Seal between the plunger and the needle can be tightened for high-pressure injection.
- Replaceable needle/plunger kits and barrels (available on request).

24548

24773

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
0.5 µL	KH	25	2.75"/70 mm	2	7000.5	86259	ea.	24545
0.5 µL	KH	25	2.75"/70 mm	3	7000.5	86250	ea.	24546
1.0 µL	KH	22s	2.75"/70 mm	2	7101	86211	ea.	24549
1.0 µL	KH	25s	2.75"/70 mm	2	7001	80135	ea.	24547
1.0 µL	KH	25s	2.75"/70 mm	3	7001	80100	ea.	24548
2.0 µL	KH	25	2.75"/70 mm	2	7002	88411	ea.	24551
5.0 µL	KH	24	2.75"/70 mm	2	7105	88011	ea.	24555
5.0 µL	KH	24	2.75"/70 mm	3	7105	88000	ea.	24556

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
0.5 µL	R	23	70 mm	2	0.5BR-7BV	000311	ea.	24771
0.5 µL	R	23	70 mm	Cone	0.5BR-7	000310	ea.	24772
0.5 µL	R	26	70 mm	Cone	0.5BR-OC-7/0.47*	000376	ea.	24770
1.0 µL	R	23	70 mm	2	1BR-7BV	000506	ea.	24775
1.0 µL	R	23	70 mm	Cone	1BR-7	000505	ea.	24774
1.0 µL	R	23	50 mm	Cone	1BR-5	000500	ea.	24773
1.0 µL	R	26	70 mm	Cone	1BR-7/0.47*	000570	ea.	24776
5.0 µL	R	23	70 mm	2	5BR-7BV	000803	ea.	24779
5.0 µL	R	23	70 mm	Cone	5BR-7	000802	ea.	24778
5.0 µL	R	23	50 mm	Cone	5BR-5	000800	ea.	24777

*70 mm needle length, 0.47 mm OD, on-column syringe.

Replacement Plunger-in-Needle Kits

- Kits are supplied with both a plunger and a needle.
- Plunger and needle must be replaced together.

SGE

Volume	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	For Syringe cat.#	qty.	Restek cat.#
0.5 µL	23	70 mm	2	NP0.5B-7BV	033060	24771	kit	24831
0.5 µL	23	70 mm	Cone	NP0.5B-7C	033057	24772	kit	24830
0.5 µL	26	70 mm	Cone	NP0.5B-OC-7	033630	24770	kit	24832
1.0 µL	23	70 mm	2	NP1B-7BV	034060	24775	kit	24835
1.0 µL	23	70 mm	Cone	NP1B-7C	034057	24774	kit	24834
1.0 µL	23	50 mm	Cone	NP1B-5C	034055	24773	kit	24833
1.0 µL	26	70 mm	Cone	NP1B-OC-7/0.47	034610	24776	kit	24836
5.0 µL	23	70 mm	2	NP5B-7BV	035058	24779	kit	24839
5.0 µL	23	70 mm	Cone	NP5B-7C	035057	24778	kit	24838
5.0 µL	23	50 mm	Cone	NP5B-5C	035055	24777	kit	24837

Guide to Needle Termination Codes

Hamilton:
(N) Cemented Needle
(RN) Removable Needle
(ASN) Autosampler Cemented Needle
(ASRN) Autosampler Removable Needle
(TLL) PTFE Luer Lock
(KH) Knurled Hub
(LT) Luer Tip
(LTN) Luer Tip Cemented Needle

SGE:
(F) Fixed Needle
(R) Removable Needle
(LL) Luer Lock
(LT) Luer Tip

24558

24727

PTFE Tip, Gas-Tight Syringes

- Suitable for gases or liquids.
- High accuracy of dispensed volumes.
- Interchangeable barrels, plungers, and tips extend performance and increase cost-effectiveness.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	26s	2"/51 mm	2	1701	80000	ea.	24557
10 µL	RN	26s	2"/51 mm	2	1701	80030	ea.	24558
25 µL	N	22s	2"/51 mm	2	1702	80200	ea.	24559
25 µL	RN	22s	2"/51 mm	2	1702	80230	ea.	24560
50 µL	N	22s	2"/51 mm	2	1705	80900	ea.	24561
50 µL	RN	22s	2"/51 mm	2	1705	80930	ea.	24562
100 µL	N	22s	2"/51 mm	2	1710	81000	ea.	24563
100 µL	RN	22s	2"/51 mm	2	1710	81030	ea.	24564
250 µL	N	22s	2"/51 mm	2	1725	81100	ea.	24567
250 µL	RN	22s	2"/51 mm	2	1725	81130	ea.	24568
500 µL	LTN	22	2"/51 mm	2	1750	81217	ea.	24571
500 µL	RN	22	2"/51 mm	2	1750	81230	ea.	24572
1 mL	LTN	22	2"/51 mm	2	1001	81317	ea.	24575
1 mL	RN	22	2"/51 mm	2	1001	81330	ea.	24576
1 mL	TLL	*		w/out slots	1001	81320	ea.	24578
2.5 mL	TLL	*		w/out slots	1002	81420	ea.	24584
2.5 mL	RN	22	2"/51 mm	2	1002	81430	ea.	24582
2.5 mL	N	22	2"/51 mm	2	1002	81417	ea.	24581
5 mL	TLL	*		w/out slots	1005	81520	ea.	20178
10 mL	TLL	*		w/out slots	1010	81620	ea.	20179
25 mL	TLL	*		w/out slots	1025	82520	ea.	24591
50 mL	TLL	*		w/out slots	1050	85020	ea.	24717
100 mL	TLL	*		w/out slots	1100	86020	ea.	24724

*Needles sold separately. See page 365.

24761

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	26	50 mm	2	10F-GT	002200	ea.	24725
10 µL	R	26	50 mm	2	10R-GT	002250	ea.	24726
25 µL	F	25	50 mm	2	25F-GT	003200	ea.	24727
25 µL	R	25	50 mm	2	25R-GT	003250	ea.	24728
50 µL	F	25	50 mm	2	50F-GT	004200	ea.	24729
50 µL	R	25	50 mm	2	50R-GT	004250	ea.	24730
100 µL	F	25	50 mm	2	100F-GT	005200	ea.	24734
100 µL	R	25	50 mm	2	100R-GT	005250	ea.	24735
100 µL	LL	*			100F-LL-GT	005230	ea.	24737
250 µL	F	25	50 mm	2	250F-GT	006200	ea.	24738
250 µL	R	25	50 mm	2	250R-GT	006250	ea.	24739
250 µL	LL	*			250F-LL-GT	006230	ea.	24741
500 µL	F	25	50 mm	2	500F-GT	007200	ea.	24742
500 µL	R	25	50 mm	2	500R-GT	007250	ea.	24743
1 mL	R	23	50 mm	2	1MR-GT	008100	ea.	24750
1 mL	LL	*			1MDF-LL-GT	008025	ea.	24752
2.5 mL	LL	*			2.5MDF-LL-GT	008425	ea.	24755
5 mL	LL	*			5MDR-LL-GT	008760	ea.	24757
10 mL	LL	*			10MDR-LL-GT	008960	ea.	24759
25 mL	LL	*			25MDR-LL-GT	009462	ea.	24760
50 mL	LL	*			50MR-LL-GT	009660	ea.	24761
100 mL	LL	*			100MR-LL-GT	009760	ea.	24762

*Needles sold separately. See page 365.

PTFE Tip, Gas-Tight Syringe Replacement Needles for Removable Needle Syringes

Materials: stainless steel needle, nickel-plated brass hub.

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5–100 µL	26s	2"	2	7758-02	6-pk.	24939
5–100 µL	22s	2"	2	7758-03	6-pk.	24940
250 µL–10 mL	22	2"	2	7779-01	6-pk.	24942
250 µL–10 mL	26s	2"	2	7779-02	6-pk.	24943
250 µL–10 mL	22s	2"	2	7779-03	6-pk.	24944

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
5 µL	26	50 mm	2	036110	5-pk.	24802
10 µL	23	50 mm	2	037111	5-pk.	24804
10 µL	26	50 mm	2	037110	5-pk.	24803
25–500 µL	23	50 mm	2	038111	5-pk.	24806
25–500 µL	25	50 mm	2	038110	5-pk.	24805
1–2.5 mL	23	50 mm	2	039110	5-pk.	24807

Replacement Plunger Assembly, PTFE-Tipped

for Agilent 7673, 7683, 7693A, and 6850 Autosampler Syringes

Hamilton

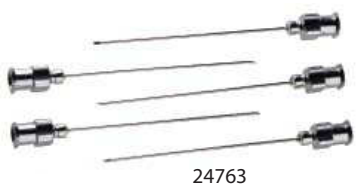
Syringe Volume	Needle Term.	Hamilton cat.#	qty.	Restek cat.#
10 µL	N, RN, LT/LTN	13205	ea.	24919

Gas-Tight Syringe Replacement Needles for Luer Lock Syringes

Hamilton

Hub Material	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
metal	26s	2"/51 mm	2	90053	6-pk.	20133
metal	25s	1.97"	3	90049*	6-pk.	24605
metal	22s	2"/51 mm	2	90051	6-pk.	24606
Kel-F (PTFE tip)	26s	2"/51 mm	2	90153	6-pk.	24607
Kel-F (PTFE tip)	25s	1.97"	3	90149*	6-pk.	24608
Kel-F (PTFE tip)	22s	2"/51 mm	2	90151	6-pk.	24609

*For Waters U6K injection valve.



SGE

Hub Material	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
metal	23	50 mm	2	039802	5-pk.	24763
metal	18	50 mm	2	039842	5-pk.	24764
metal	22	2"/51 mm	3	039895**	2-pk.	24765

**For Rheodyne/Valco valves.

24881

24887

SGE Gas-Tight Syringes with Shut-off Valves

- Ideal for sample storage and transportation.
- Push-pull shut-off valve.

SGE

Syringe Fitted with Removable Needle and Valve

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#
50 µL	50R-V-GT	004279	ea.	24880
100 µL	100R-V-GT	005279	ea.	24881
250 µL	250R-V-GT	006279	ea.	24882
500 µL	500R-V-GT	007279	ea.	24883
1 mL	1MDR-V-GT	008110	ea.	24884
2.5 mL	2.5MDR-V-GT	008510	ea.	24885

SGE

Syringe Fitted with Luer Lock Valve*

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#
1 mL	1MR-VLL-GT	008160	ea.	24886
2.5 mL	2.5MDR-VLL-GT	008560	ea.	24887
5 mL	5MDR-VLLMA-GT	008770	ea.	24888
10 mL	10MDR-VLLMA-GT	008970	ea.	24889
25 mL	25MDR-VLLMA-GT	009472	ea.	24890
50 mL	50MR-VLLMA-GT	009670	ea.	24891
100 mL	100MR-VLLMA-GT	009770	ea.	24892

*Order needles separately.

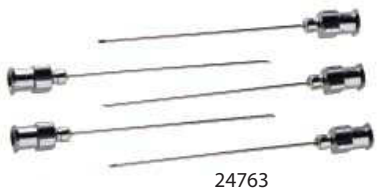
Replacement Needles for Gas-Tight Syringes with Shut-off Valves

24898

SGE

Model V Syringe Valve: fits any SGE removable needle syringe, 25 µL-2.5 mL

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
25 µL–2.5 mL	23	50 mm	Cone	V	031905	ea.	24898



24763

SGE

Luer Lock Needles

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
1 mL–100 mL	23	50 mm	2	NLL-5/23	039802	5-pk.	24763
1 mL–100 mL	18	50 mm	2	NLL-5/18	039842	5-pk.	24764
1 mL–100 mL	22	2"/51 mm	3	NLL-LC	039895**	2-pk.	24765

**Fits Rheodyne & Valco injection valves.

Economical Hamilton Syringe Guide*

24616

- Prevents syringe plunger from bending.
- Adjustable stop prevents plunger damage.
- Easily installed.
- Used with syringe series 700/1700/1000.

Syringe Volume	Hamilton cat.#	qty.	Restek cat.#
25–500 µL	14906	ea.	24615
5–10 µL	14806	ea.	24616

*Syringe not included.

Gas-Tight Syringes for Rheodyne® & Valco® Valves

- PTFE-tipped plungers.
- Removable needles.
- Replaceable syringe barrels, plungers, and plunger tips.

For complete loop-fill, the syringe capacity should be >2X the loop volume.

21260

24868

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	RN	26s	2"/51 mm	3	1701	80065	ea.	21260
25 µL	RN	22s	2"/51 mm	3	1702	80265	ea.	21261
50 µL	RN	22s	2"/51 mm	3	1705	80965	ea.	21262
100 µL	RN	22s	2"/51 mm	3	1710	81065	ea.	21263
250 µL	RN	22s	2"/51 mm	3	1725	81165	ea.	21264

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	R	22	2"	3	10R-GT-LC	002313	ea.	24866
25 µL	R	22	2"	3	25R-GT-LC	003312	ea.	24867
50 µL	R	22	2"	3	50R-GT-LC	004312	ea.	24868
100 µL	R	22	2"	3	100R-GT-LC	005312	ea.	24869
250 µL	R	22	2"	3	250R-GT-LC	006312	ea.	24870
500 µL	R	22	2"	3	500R-GT-LC	007312	ea.	24871

Replacement Needles for Gas-Tight Syringes for Rheodyne® & Valco® Valves

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
5–100 µL	22s	2"	3	7770-01	6-pk.	24941
250 µL–10 mL	22	2"	3	7780-04	6-pk.	24945

24941

SGE

Syringe Volume	Needle Gauge	Needle Length	Point Style	SGE cat.#	qty.	Restek cat.#
10 µL	22	2"	3	037250	5-pk.	24808
25–500 µL	22	2"	3	038250	5-pk.	24809

24808

Gas-Tight Syringes

20162

High-purity VOC single-stage regulator is described on page 425 of the Air Sampling Products section.

A-2 Luer Gas-Tight Syringes*

- For use with VOA-CYL 4 standards.
- Push-style on-off button valve.

Use to withdraw a gas sample from a high-pressure cylinder through a high-purity VOC single-stage regulator after attaching the appropriate adaptor to the regulator. Use with luer syringe needles listed.

Description	qty.	cat.#
100 µL Luer Syringe	ea.	20162
500 µL Luer Syringe	ea.	20163

*Restek's A-2 syringes have a luer tip.

Replacement Needles for A-2 Luer Gas-Tight Syringes

Description	Needle Gauge	Size	qty.	cat.#
Luer Syringe Needles for 100 µL A2 Gas-Tight Syringes	22	0.028" OD x 0.006" ID x 2"	3-pk.	22783
Luer Syringe Needles for 500 µL A2 Gas-Tight Syringes	22	0.028" OD x 0.012" ID x 2"	3-pk.	22784

21208

Heavy Duty Purge & Trap Syringe Dynatech Precision Sampling

- Heavy-duty glass barrel with metal front and rear flanges.
- PTFE luer lock tip.
- Can fill and empty sparge tubes.
- Sample-Lok valve accepts standard luer lock needles.
- Suitable for purge & trap applications.

	2 mL	5 mL	10 mL
Syringe	cat.#	cat.#	cat.#
without Sample-Lok	21205	21206	21209
with Sample-Lok		21208	21207

21283

Luer Lock Valve Adaptors

Use a luer lock valve adaptor to connect a luer lock fitting to a Rheodyne® or Valco® valve.

Description	SGE cat. #	qty.	Restek cat.#
Luer Lock Valve Adaptors	200010	2-pk.	21283

Jumbo Syringe

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a subsample. The plunger stem is detachable, making sample storage easy.

21276

Volume	SGE Model	SGE cat.#	qty.	Restek cat.#
500 mL	500MAR-LL-GT	009910	ea.	21275
1,000 mL	1000MAR-LL-GT	009920	ea.	21276
2,000 mL	2000MAR-LL-GT	009930	ea.	21277

Syringe O-Rings

21279

21278

Syringe Volume	SGE cat.#	qty.	Restek cat.#
500 mL	032527	ea.	21278
1,000 mL	032532	ea.	21279

21252

24860

Economical Microliter Liquid-Type Syringes for Rheodyne® & Valco® Valves

- Cemented/fixed needles.
- Plungers and barrels are not interchangeable or replaceable.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	N	22s	2"	3	701	80365	ea.	21250
25 µL	N	22s	2"	3	702	80465	ea.	21251
50 µL	N	22s	2"	3	705	80565	ea.	21252
100 µL	N	22s	2"	3	710	80665	ea.	21253
250 µL	N	22s	2"	3	725	80765	ea.	21254

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	SGE cat.#	qty.	Restek cat.#
10 µL	F	22	2"	3	10F-LC	002301	ea.	24860
25 µL	F	22	2"	3	25F-LC	003300	ea.	24861
50 µL	F	22	2"	3	50F-LC	004300	ea.	24862
100 µL	F	22	2"	3	100F-LC	005300	ea.	24863
250 µL	F	22	2"	3	250F-LC	006300	ea.	24864
500 µL	F	22	2"	3	500F-LC	007300	ea.	24865

21265

24759

Priming Syringes for Waters 6000, 6000A, 501, 510, 590, 610 and 610E HPLC Pumps

- Designed for maximum safety with metal flange and luer lock (LL) hub.
- PTFE-tipped plunger.

Hamilton

Volume	Needle Term.	Hamilton Model	Hamilton cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	TLL	1010W	81610	700 psig	ea.	21265

SGE

Volume	Needle Term.	SGE Model	SGE cat.#	Pressure Tested to	qty.	Restek cat.#
10 mL	LL	10MDR-LL-GT	008960	100 psig	ea.	24759

*Needles sold separately.

21257

Syringes for Waters U6K Valves

- Reinforced plungers.
- Removable needles.
- Replaceable plunger/barrel assemblies.
- Barrel stop prevents plunger blowout.

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	Hamilton cat.#	qty.	Restek cat.#
10 µL	RN	25s	1.97"	3	801	84815	ea.	21255
25 µL	RN	25s	1.97"	3	802	84816	ea.	21256
50 µL	RN	25s	1.97"	3	805	84817	ea.	21257
100 µL	RN	25s	1.97"	3	810	84818	ea.	21258
250 µL	RN	25s	1.97"	3	825	84819	ea.	21259

21270

Replacement Needles for Syringes for Waters U6K Valves

Hamilton

Syringe Volume	Needle Gauge	Needle Length	Point Style	Hamilton cat.#	qty.	Restek cat.#
10–100 µL	25s	1.97"	3	8647-01	6-pk.	21270
250 µL–10 mL	25s	1.97"	3	8648-01	6-pk.	21271

Syringes for LC Autosamplers

SGE
for Hitachi LC Autosamplers

Volume	SGE Model	cat.#	qty.	Restek cat.#
500 µL, M10 X1 Thread	500C-HITACH1	007660	ea.	22292


22292

SGE
for PerkinElmer LC Autosamplers

Volume	SGE Model	cat.#	qty.	Restek cat.#
100 µL, 1/4-28 UNF Thread	100D-CX-GT	005990	ea.	22296
250 µL, 1/4-28 UNF Thread	250D-CX-GT	006995	ea.	22297
500 µL, 1/4-28 UNF Thread	500D-CX-GT	007995	ea.	22298
1 mL, 1/4-28 UNF Thread	1MD-C-GT	008185	ea.	22299


22297

Syringes for Waters WISP LC Autosamplers

PTFE-tipped plungers

Hamilton

Volume	Hamilton Model	cat.#	qty.	Restek cat.#
25 µL, 1/4-28 UNF Thread	1702	80020	ea.	24528
250 µL, 1/4-28 UNF Thread	1725	80024	ea.	24529


24528

SGE

Volume	SGE Model	cat.#	qty.	Restek cat.#
25 µL, 1/4-28 UNF Thread	25D-WISP	003990	ea.	22293
250 µL, 1/4-28 UNF Thread	250D-WISP	006690	ea.	22294


22294

Syringes for CTC LC Autosamplers

Hamilton

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	Hamilton Model	cat.#	qty.	Restek cat.#
10 µL	N	22s	2"/51 mm	3	701N	203073	ea.	22743
25 µL	N	22s	2"/51 mm	3	1702N	203075	ea.	22744
100 µL	N	22s	2"/51 mm	3	1710N Slim Line*	203077	ea.	22745
100 µL	N	22	2"/51 mm	3	1710N	203235	ea.	22746
250 µL	N	22	2"/51 mm	3	1725N	203079	ea.	22747
500 µL	N	22	2"/51 mm	3	1750N	203349	ea.	22748

*Barrel OD = 6.7 mm; all other 25 µL and 100 µL syringes have a 7.9 mm barrel OD.


22746

SGE

Volume	Needle Term.	Needle Gauge	Needle Length	Point Style	SGE Model	cat.#	qty.	Restek cat.#
10 µL	F	22s	2"/51 mm	LC	10F-CTC-LC	002710	ea.	22737
100 µL*	R	22s	2"/51 mm	LC	100R-C/T-GT-LC	005330	ea.	22741
500 µL*	F	22s	2"/51 mm	LC	500F-CTC-GT-LC(0.41)	007720	ea.	22742

*Gas-tight syringe.


22741


Resprep
Florisil
26228
Resprep
Florisil
24034
RESTEK

Sample Handling

Sample Preparation

Glassware

Air Sampling

Gas Sampling

Sample Preparation

Resprep®

Solid Phase Extraction Cartridges

from Restek

Proven Quality, Superior Cleanliness, and Method-Specific Performance

Resprep® solid phase extraction (SPE) cartridges are manufactured with specially cleaned sorbents and high-purity materials to minimize background and to help eliminate troublesome interference. In order to ensure reproducibility, every finished product goes through rigorous QC testing, targeted to specific applications whenever possible, and an extensive certificate of analysis details the results.

Available with the following sorbents:

- **Silica:** Multipurpose
- **EPH Silica:** Petroleum
- **Florisil® Adsorbent:** Pesticides
- **CarboPrep® Adsorbent:** Dirty Samples

See **page 375** for details or visit

www.restek.com/**resprep**

Resprep® SPE Cartridges (Normal Phase)

Hydrophilic (polar) adsorbents used to extract hydrophilic analytes from nonpolar matrices, such as organic solvents (e.g., polar contaminants from sample extracts).

	3 mL/500 mg (50-pk.)	6 mL/500 mg (30-pk.)	6 mL/1,000 mg (30-pk.)	15 mL/2 g (15-pk.)
Florisil (EPA SW 846 methods and CLP protocols)	24031 24032*	26086**	24034 26085**	26228
Silica (EPA SW 846 methods)	24035 24036*		24038	

*PTFE frits
**Glass tubes with PTFE frits

24031

All cartridges are manufactured using high density polypropylene and have polyethylene frits unless otherwise noted.

Cartridges may be processed by any one or all of these techniques: positive pressure, sidearm flask, centrifuge, or vacuum manifold.

Resprep® SPE Cartridges (Bonded Reversed Phases)

Hydrophobic (nonpolar) silica-based adsorbents; used to extract hydrophobic analytes from polar matrices, such as water (e.g., pesticides from water).

	1 mL/100 mg (100-pk)	3 mL/200 mg (50-pk.)	3 mL/500 mg (50-pk.)	6 mL/500 mg (30-pk.)	6 mL/1,000 mg (30-pk.)	60 mL/10 g (16-pk.)
C18 (high load, endcapped)	26030	26031	24050	24052	24051	26035

Closed End SPE Cartridge: Activated Sodium Sulfate

- High quality anhydrous sodium sulfate.
- Approximately 2 grams prepackaged in a convenient capped cartridge with both male and female luer ends for easy connection to a variety of devices or equipment.
- The adsorbent is fully activated and ready to use for removal of excess water from organic solvent solutions, prior to many types of analysis.
- Capped cartridges will remain active for long periods of storage in the lab.

SPE Cartridge	Bed Weight	qty.	cat#
Activated Sodium Sulfate	2 g	50-pk.	26207

CarboPrep® Reversing SPE Cartridges

- High adsorbent capacity (surface area ~200 m^2/g) for large volume sampling.
- Chromatographic grade graphitized carbon provides consistent and quantitative recoveries of a wide variety of semivolatiles, pesticides, and herbicides.
- 500 mg bed weight.

Reversing cartridge design allows convenient inverted elution of strongly retained analytes using minimum solvent volumes. Ideal design for extraction of pesticides in water.[1]

SPE Cartridge	Bed Weight	qty.	cat#
CarboPrep 200 Reversing Cartridge	500 mg	30-pk.	26206

[1]Crescenzi, C.; DiCorcia, A.; Guerriero, E.; and Saperi, R. "Development of a Multiresidue Method for Analyzing Pesticide Traces in Water Based on Solid-Phase Extraction and Electrospray Liquid Chromatography Mass Spectrometry", Environmental Science & Technology vol.31, no. 2 (1997) 479-488.
(Reference not available from Restek.)

26091

Excellent for Pesticide Residue Cleanup!

CarboPrep® SPE Cartridges

- Improved recovery of sulfonylurea herbicides, phenols, carbamates, and triazine herbicides, compared to C18 and C8 cartridges.
- Wide range of selectivity for both analytes and their metabolites or degradation products.
- Rapid sampling flow rates; uncompromised recoveries.
- Maximum capacity for contaminant cleanup.
- Controlled manufacturing improves cleanliness, ensures reproducible performance.

CarboPrep® cartridges are manufactured from chromatographic-grade, nonporous, graphitized carbon. Our manufacturing process minimizes variability and improves recovery and cleanup procedures. We offer two types of carbons: CarboPrep® 90 has a surface area of approximately 90 m^2/g, and CarboPrep® 200 has a surface area of 200 m^2/g. Both have higher capacity than silica-based packings for a variety of compounds.

CarboPrep® cartridges can be used for sample extraction of organic compounds and extract cleanup of matrix interferences.

SPE Cartridge	Tube Volume, Bed Weight	qty.	cat.#
CarboPrep 90	3 mL, 250 mg	50-pk.	26091
CarboPrep 90	6 mL, 500 mg	30-pk.	26092
CarboPrep 200	3 mL, 250 mg	50-pk.	26088
CarboPrep 200	6 mL, 500 mg	30-pk.	26087

Resprep®

Solid Phase Extraction Cartridges
from Restek

- Proven Quality
- Superior Cleanliness
- Method-Specific Performance

Pesticide Residue Cleanup SPE Cartridges

- Convenient, multiple adsorbent beds in a single cartridge.
- For use in multiresidue pesticide analysis to remove matrix interferences.
- Excellent for cleanup of dietary supplement extracts.

SPE Cartridge	qty.	cat.#
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 90/500 mg Aminopropyl, Polyethylene Frits	30-pk.	26193
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 90/500 mg PSA, Polyethylene Frits	30-pk.	26194
6 mL SPE Cartridge Packed with 500 mg PSA, Polyethylene Frits	30-pk.	26195
6 mL Combo SPE Cartridge Packed with 200 mg CarboPrep 200 and 400 mg PSA, PTFE Frits	30-pk.	26127
6 mL Combo SPE Cartridge Packed with 250 mg CarboPrep 200 and 500 mg PSA, PTFE Frits	30-pk.	26128
6 mL Combo SPE Cartridge Packed with 500 mg CarboPrep 200 and 500 mg PSA, PTFE Frits	30-pk.	26129

Method Specific SPE Cartridges

These cartridges have been specifically designed to provide consistent and reproducible results for the method or application stated.

Description	Applications	Tube Volume, Bed Weight	qty.	cat.#
EPH Fractionation	Separation of aliphatic and aromatic hydrocarbons into distinct extract fractions. Specially treated to reduce contaminants and increase capacity. Silica packing.	20 mL, 5 g	15-pk.	26065
EPA Methods 521 & 522	For use in EPA Method 521: Nitrosamines in Drinking Water and EPA Method 522 for 1,4-Dioxane in Drinking Water. Activated charcoal packing.	6 mL, 2 g	30-pk.	26032
EPA Method 548.1	Extraction of endothall from aqueous samples. Weak anion exchange resin (BioRex 5) packing.	6 mL	30-pk.	26063
Ultra Quat SPE	For use in HPLC analysis of paraquat/diquat, as an alternative to EPA 549.2. For an HPLC column developed specifically for this application, see page 163.	6 mL, 500 mg	30-pk.	25499
Organo Tin	High-capacity clean-up of butyl and phenyl tin compounds from soil, water, and biota. Mixed bed.	60 mL	16-pk.	24049
RDX	Extraction of explosive compounds (similar to EPA Method 8095 and 8330 list) from water samples.	6 mL, 500 mg	30-pk.	26093

Resprep® SPE Tube Parts & Accessories

Empty Tubes (polypropylene)	Volume	qty.	cat.#
	1 mL	50-pk.	26010
	3 mL	50-pk.	26011
	6 mL	50-pk.	26012
	15 mL	50-pk.	26013
	sample reservoir, 25 mL	12-pk.	26014
	sample reservoir, 60 mL	12-pk.	26015
Frits (polyethylene), 20 µm	**Fits Tube Volume, Diameter**	**qty.**	**cat.#**
	1 mL, 6 mm	100-pk.	26016
	3 mL, 9 mm	100-pk.	26017
	6 mL, 1.2 cm	100-pk.	26018
	15 mL, 1.6 cm	100-pk.	26019
	25 mL, 2.0 cm*	100-pk.	26020
	60 mL, 2.6 cm	100-pk.	26021
Tube Caps (polyethylene)	**Fits Tube Volume**	**qty.**	**cat.#**
	1 mL	12-pk.	26001
	3 mL	12-pk.	26002
	6 mL	12-pk.	26003
	15 mL	12-pk.	26004
	25 mL*	12-pk.	26005
	60 mL	12-pk.	26006
Female Luer End Caps (polypropylene)	**Fits Tube Volume**	**qty.**	**cat.#**
	universal	12-pk.	26000
Connectors (polypropylene)	**Fits Tube Volume**	**qty.**	**cat.#**
	1, 3, 6 mL	12-pk.	26007
	15, 25 mL*	12-pk.	26008
	60 mL	12-pk.	26009

*For 20 mL packed tubes.

Resprep® tubes, frits, caps, and connectors for your method development needs.

26003

26000

26007

Manifolds & Replacement Parts

26077

Resprep® 12- or 24-Port SPE Manifolds

- Use with any standard male luer end SPE cartridges.
- Inert, PTFE sample guides reduce cross-contamination and carryover.
- Flexible sample collection rack will accommodate a variety of receiving vessels.
- Quick vacuum-release valve for better system control.
- Individual valves allow vacuum control for each cartridge—improves reproducibility.

26078

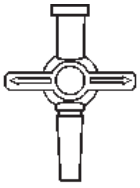
Waste Container*

26077

*

26079

Resprep® Manifold Replacement Parts



Valve
26083

Valve
Attachment
26130

Manifold Lid

Needle
Attachment
26131

Sample Guide
26084

Description	qty.	cat.#
Complete Resprep SPE Manifold, 12-Port (Includes: glass basin with built-in vacuum regulator, polypropylene lid with 12 individual control valves, 12-position collection rack, 12 PTFE sample guides, and waste container.)	kit	26077
Complete Resprep SPE Manifold, 24-Port (Includes: glass basin with built-in vacuum regulator, polypropylene lid with 24 individual control valves, 24-position collection rack, and 24 PTFE sample guides.)	kit	26080

Resprep® Manifold Replacement Parts

Description	qty.	cat.#
Replacement Waste Container, 12-Port	ea.	24014
Replacement Vacuum Valve and Gauge Assembly	ea.	24008
Glass Vacuum Chamber w/gauge & valve for Resprep manifolds, 6 or 12-Port	ea.	25991
Collection Rack		
Collection Rack, 12-Port	ea.	26079
Collection Rack, 24-Port	ea.	26082
Manifold Lid		
Replacement Manifold Lid (sample guides not included), 12-Port	ea.	26078
Replacement Manifold Lid (sample guides not included), 24-Port	ea.	26081
Manifold Lid Replacement Parts		
Valves, 12 or 24-Port	2-pk.	26083
Valve Attachment	48-pk.	26130
Needle Attachment	48-pk.	26131
Sample Guides, 12 or 24-Port	12-pk.	26084

*Not included in 24-port manifold kit (cat.# 26080).

CE

24002

Oil-Free Vacuum/Pressure Station for 12-Port Resprep® SPE Systems

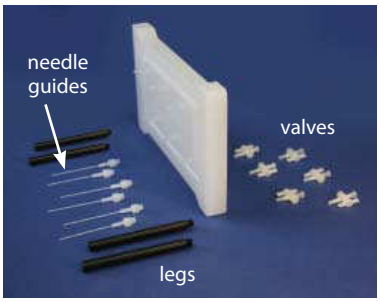
Allows switching from pressure to vacuum in a matter of seconds. Quiet, oil-free unit won't contaminate the extraction system or your samples. Provides 20" Hg (68 kPa) vacuum or 18 psi (124 kPa) pressure.

Description	qty.	cat.#
Oil-Free Vacuum/Pressure Station, 115VAC, 60Hz, US	ea.	24002
Oil-Free Vacuum/Pressure Station, 230VAC, 50Hz, Europe (CE certified)	ea.	24003
Vacuum Tubing (10 ft./3 m, 1/4" ID)	ea.	24016

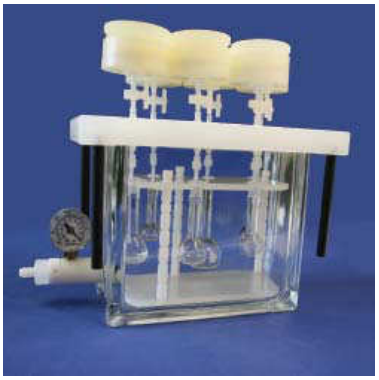
Not recommended for use with 24-port manifold.
Warranty period is one year from date of purchase. Evaluation fee is charged for repairs out of warranty.

Resprep® 6-Port Disk Manifold Lid

- Low cost option for disk extraction; fits standard 3 3/4" x 7 1/2" glass vacuum chambers.
- Doubles sample capacity—holds six disks, compared to standard 12-port manifolds, which only hold three.
- Individual vacuum control for each port improves reproducibility.
- Collection plate design secures variety of receiving vessels.
- Inert PTFE sample guides reduce cross-contamination and carryover.
- Compatible with any standard male luer end disk holder.



Lid components prior to assembly.


Fully assembled unit shown with glass vacuum chamber (cat.# 25991) and disk holders (cat.# 24020).

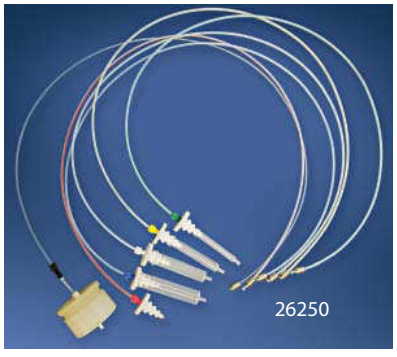
Description	qty.	cat.#
Resprep 6-Port Disk Manifold Lid* Includes: polypropylene lid with 6 ports, 6 nylon valves, 6 PTFE needle guides, 4 black lid legs, collection baseplate, collection plate for volumetric flasks, collection plate for concentrator tubes, 3 white collection plate posts, 12 collection plate retaining clips	kit	25992
Accessories		
Glass Vacuum Chamber w/gauge & valve for Resprep manifolds, 6 or 12-Port	ea.	25991
Manifold Lid Replacement Parts		
Valves, 12 or 24-Port	2-pk.	26083
Valve Attachment	48-pk.	26130
Needle Attachment	48-pk.	26131
Sample Guides, 12 or 24-Port	12-pk.	26084
Gasket, 12-port	2-pk.	24011

*Vacuum chamber (cat.# 25991) not included.

Resprep® Sample Delivery System

- Compatible with Resprep® 1, 3, 6, and 15 mL SPE cartridges and Diskcover-47 extraction disk holder (cat.# 24020).
- Six PTFE transfer lines (1/8" OD x 1/16" ID x 36" long); each is banded with a different color for easy sample identification.
- Specified in EPA drinking water methods.
- Tested to pH of 1 to ensure no contaminants leach from system.

Use the Resprep® sample delivery system to transfer large volumes of low viscosity samples directly from a bottle to a solid phase extraction cartridge, or to a disk on a vacuum manifold system for extraction or cleanup. Each unit consists of six transfer lines with a stainless steel weight on one end and a color-coded screw fitting and polyethylene terephthalate (PET) adapter on the opposite end.



Description	qty.	cat.#
Resprep Sample Delivery System	6-pk.	26250

Resprep® disks & flow filters extract analytes of interest at high flow rates and significantly reduce clogging.

Resprep®-C18 and Resprep®-C8 SPE Disks

- Glass fiber disks embedded with C18 or C8 bonded silica.
- Extract semivolatile organic compounds.
- Deep-pore design reduces clogging and allows faster flow rates.
- Meet requirements for EPA Methods 525.1, 506, 550.1, and 549.1.
- Lower cost than PTFE disks.

Description	Diameter	qty.	cat.#
Resprep-C8	47 mm	24-pk.	24048
Resprep-C18	47 mm	20-pk.	24004
Resprep-C18	90 mm	12-pk.	25988

Resprep® Oil & Grease SPE Disks

- 47 mm glass fiber disks embedded with specialty bonded silica.
- Meet requirements for EPA Method 1664.*
- Reduce emulsion formation and amount of solvent required by previous EPA methods.
- No chlorofluorocarbons needed.

Description	qty.	cat.#
Resprep Oil & Grease SPE Disks	20-pk.	26022

*A sodium sulfate drying tube and a 0.45 µm PTFE syringe filter (cat.# 26145, page 386) also may be used.

26024

Resprep® SPE Flow Filters

- Designed specifically to improve flow when filtering oil and grease samples.
- Use with Resprep® Diskcover-47 reservoir, or any 47 mm glass sample reservoir.

Description	qty.	cat.#
Resprep SPE Flow Filters	20-pk.	26024

26023

Resprep® Resin SPE Disks

- 47 mm glass fiber disks embedded with styrene/DVB resin.
- For chlorinated, benzidine-containing, or nitrogen-containing pesticides.
- Meet requirements of EPA Methods 515.2 and 553.

Description	qty.	cat.#
Resprep Resin SPE Disks	20-pk.	26023

Parts for Diskcover-47 Extraction System

Diskcover-47 Extraction Disk Holder

- Compatible with most vacuum manifold systems that accept 1/8-inch male luer fittings.
- Sample can be automatically introduced via 1/8-inch PTFE tubing or from the optional Diskcover-47 reservoir.

Description	qty.	cat.#
Diskcover-47 Extraction Disk Holder	ea.	24020
Diskcover-47 Extraction Disk Holder	6-pk.	24021
PTFE Tube Luer Adaptors (1/8" OD)	6-pk.	24017
PTFE Sample Tubing (2 ft./0.6 m, 1/8" OD)	6-pk.	24025

24020

Diskcover-47 Reservoir*

The Diskcover-47 open-top reservoir allows you to pour up to 125 mL of sample directly onto the filter disk holder. It easily installs on top of the Diskcover-47 extraction disk holder.

24029

Description	qty.	cat.#
Diskcover-47 Reservoir	ea.	24029
Diskcover-47 Reservoir	6-pk.	24030
PTFE O-Ring**	ea.	24027
PTFE O-Ring**	6-pk.	24028

*Must be used with the Diskcover-47 extraction disk holder.
**Order when using PTFE extraction filters.

Sodium Sulfate (Bulk Adsorbent)

- Ideal for removing water from sample extracts.
- Activate by heating to 400 °C for four hours before use.
- Packaged in recloseable 5 kg buckets.

Anhydrous sodium sulfate is the most common drying agent used to remove moisture from sample extracts. We package our 60 mesh material in recloseable buckets.

Description	qty.	cat.#
Sodium Sulfate	5 kg	26204

Florisil® PR (Bulk Adsorbent)

- Pesticide residue grade.
- Packaged in glass containers.

Florisil® PR is commonly used to remove polar interferences from pesticide residues. This bulk material is ideal for labs packing their own chromatography columns for pesticide residue extractions.

Description	qty.	cat.#
Florisil PR, 60/100 mesh	500 g	26135

Granulated Activated Copper (Bulk Adsorbent)

- Convenient form for removing sulfur from environmental extracts.
- Acidified and activated—ready for use.

Activated copper effectively removes elemental sulfur from environmental extracts. Our acid-washed and activated material can be used right out of the package. The 30 mesh granular material eliminates the potential for fine copper particles in filtered extracts.

Description	qty.	cat.#
Granulated Activated Copper, 30 mesh	1 kg	26136

Ottawa Sand (Bulk Adsorbent)

- Sample medium for matrix spikes and laboratory control blanks.
- Packaged in convenient 5 kg buckets.

Ottawa sand is listed in several U.S. EPA methods as the specified medium for matrix spike and laboratory control blanks.

Description	qty.	cat.#
Ottawa Sand	5 kg	26137

Diatomaceous Earth (Bulk Adsorbent)

- Improves extraction efficiency.
- Adsorbs moisture from samples.

Diatomaceous earth is used as a filter aid to improve extraction efficiency of densely packed soils, such as clays. By mixing the sample with diatomaceous earth, recoveries can be improved and excess moisture can be absorbed. Packaged in a convenient 1 kg quantity.

Description	Similar to Dionex part #	qty.	cat.#
Diatomaceous Earth, 30/40 mesh	062819	1 kg	26033

Q-sep™

QuEChERS Products

Ideal for multiresidue pesticide analysis from food and other matrices.

Restek Q-sep™ QuEChERS Products

Fast, Simple Sample Prep for Multiresidue Pesticide Analysis

- Ready-to-use tubes, no glassware required.
- Preweighed, ultra-pure sorbents.
- Support original unbuffered, AOAC (2007.01), European (EN 15662), and mini-multiresidue QuEChERS methods.

QuEChERS methods are fast, easy, and cost-effective, and Restek Q-sep™ products make QuEChERS procedures even simpler. All extraction salts, sorbents, and sample tubes are included—no specialized equipment or glassware is required. Prepare samples more efficiently with a complete line of QuEChERS supplies from Restek.

	Mini-Luke or Modified Luke Method	QuEChERS	Savings with QuEChERS
Estimated time to process 6 samples (min)	120	30	4x faster
Solvent used (mL)	60-90	10	6-9x less solvent
Chlorinated waste (mL)	20-30	0	Safer, cheaper, greener
Glassware/specialized equipment	capacity for 200 mL, quartz wool, funnel, water bath or evaporator	none	Ready-to-use

Selection Guide for Q-sep™ dSPE Tubes

Commodity types and examples	AOAC 2007.01	EN 15662	Mini-multiresidue	Additional products
 **Low fat & low pigment fruits & vegetables** • Celery • Cucumber • Head lettuce • Melon	**2 mL, 100-pk.** (cat.# 26124) **15 mL, 50-pk.** (cat.# 26220)	**2 mL, 100-pk.** (cat.# 26215) **15 mL, 50-pk.** (cat.# 26223)	**2 mL, 100-pk.** (cat.# 26215)	
 **Fatty or waxy fruits & vegetables** • Cereals • Avocado • Nuts & seeds • Dairy	**2 mL, 100-pk.** (cat.# 26125) **15 mL, 50-pk.** (cat.# 26221)		**2 mL, 100-pk.** (cat.# 26216)	**15 mL, 50-pk.** (cat.# 26226) **2 mL, 100-pk.** (cat.# 26242) **15 mL, 50-pk.** (cat.# 26244)
 **Pigmented fruits & vegetables** • Strawberries • Sweet potatoes • Tomatoes	**15 mL, 50-pk.** (cat.# 26222)	**2 mL, 100-pk.** (cat.# 26217) **15 mL, 50-pk.** (cat.# 26224)	**2 mL, 100-pk.** (cat.# 26217)	**2 mL, 100-pk.** (cat.# 26123)
 **Highly pigmented fruits & vegetables** • Red peppers • Spinach • Blueberries	**2 mL, 100-pk.** (cat.# 26219)	**2 mL, 100-pk.** (cat.# 26218) **15 mL, 50-pk.** (cat.# 26225)	**2 mL, 100-pk.** (cat.# 26218)	**15 mL, 50-pk.** (cat.# 26126)
 **Universal use** Wide range of commodities, including fatty & pigmented fruits & vegetables.				**2 mL, 100-pk.** (cat.# 26243) **15 mL, 50-pk.** (cat.# 26245)
Download free instructions at **www.restek.com/quechers**	Instruction sheet# 805-01-002	Instruction sheet# 805-01-001	Instruction sheet# 805-01-001	Generic dSPE 805-01-003

Q-sep™ QuEChERS Extraction Salts

- Salt packets eliminate the need for a second empty tube to transfer salts.
- Go green by using packets with reusable tubes.
- Convenient and easy to use.

Description	Material	Methods	qty.	cat.#
Q-sep Kit	4 g $MgSO_4$, 1 g NaCl with 50 mL Centrifuge Tube	original unbuffered	50 packets & 50 tubes	23991
Q-sep Packets	4 g $MgSO_4$, 1 g NaCl	original unbuffered	50 packets	23992
Q-sep Kit	4 g $MgSO_4$, 1 g NaCl, 1 g TSCD, 0.5 g DHS with 50 mL Centrifuge Tube	European EN 15662	50 packets & 50 tubes	26235
Q-sep Packets	4 g $MgSO_4$, 1 g NaCl, 1 g TSCD, 0.5 g DHS	European EN 15662	50 packets	26236
Q-sep Kit	6 g $MgSO_4$, 1.5 g NaOAc with 50 mL Centrifuge Tube	AOAC 2007.01	50 packets & 50 tubes	26237
Q-sep Packets	6 g $MgSO_4$, 1.5 g NaOAc	AOAC 2007.01	50 packets	26238
Empty 50 mL Centrifuge Tube, Polypropylene			50-pk.	26239
Empty 50 mL Centrifuge Tube, FEP			2-pk.	23997

TSCD—trisodium citrate dihydrate; DHS—disodium hydrogen citrate sesquihydrate; NaOAc—sodium acetate

Q-sep™ QuEChERS dSPE Tubes for Extract Cleanup

- Packaged in foil subpacks of 10 for enhanced protection and storage stability.
- Individually labeled tubes for easy sorbent identification.

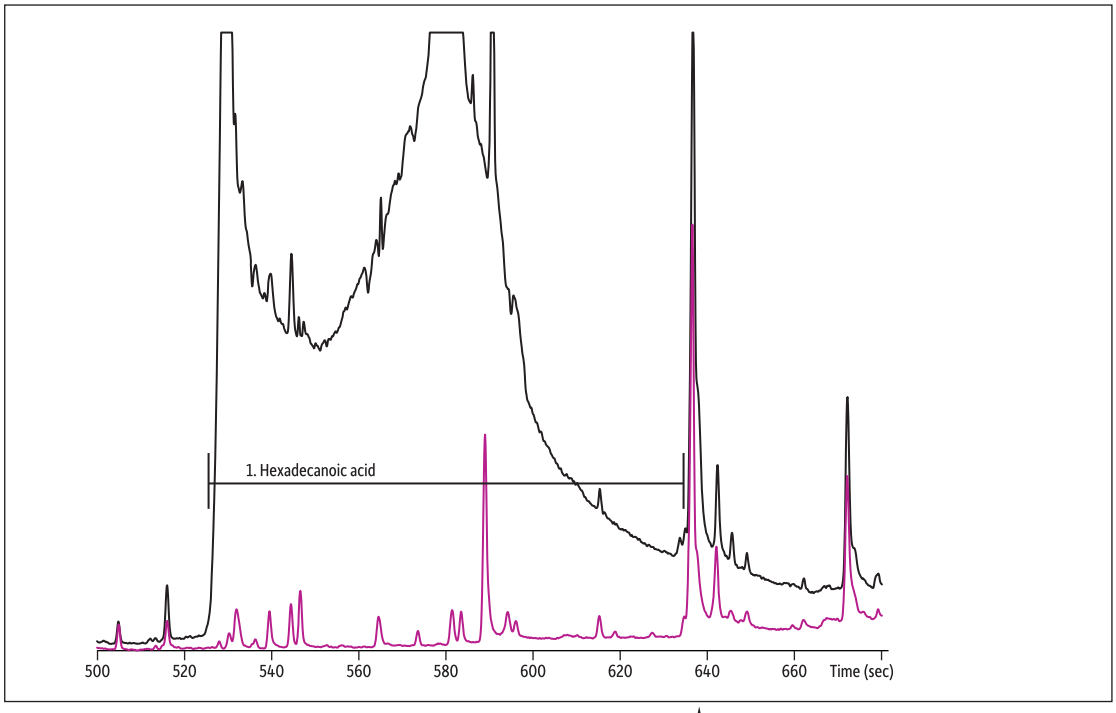
Description	Methods	qty.	cat.#
2 mL Micro-Centrifuge Tubes for dSPE (cleanup of 1 mL extract)			
150 mg $MgSO_4$, 25 mg PSA	original unbuffered, mini-multi-residue, European EN 15662	100-pk.	26215
150 mg $MgSO_4$, 25 mg PSA, 25 mg C18	mini-multiresidue	100-pk.	26216
150 mg $MgSO_4$, 25 mg PSA, 2.5 mg GCB	mini-multiresidue, European EN 15662	100-pk.	26217
150 mg $MgSO_4$, 25 mg PSA, 7.5 mg GCB	mini-multiresidue, European EN 15662	100-pk.	26218
150 mg $MgSO_4$, 50 mg PSA	AOAC 2007.01	100-pk.	26124
150 mg $MgSO_4$, 50 mg PSA, 50 mg C18	AOAC 2007.01	100-pk.	26125
150 mg $MgSO_4$, 50 mg PSA, 50 mg GCB	AOAC 2007.01	100-pk.	26123
150 mg $MgSO_4$, 50 mg PSA, 50 mg C18, 50 mg GCB	AOAC 2007.01	100-pk.	26219
150 mg $MgSO_4$, 50 mg C18	NA	100-pk.	26242
150 mg $MgSO_4$, 50 mg PSA, 50 mg C18, 7.5 mg GCB	universal	100-pk.	26243
15 mL Centrifuge Tubes for dSPE (cleanup of 6 mL and 8 mL extract)			
1,200 mg $MgSO_4$, 400 mg PSA	AOAC 2007.01	50-pk.	26220
1,200 mg $MgSO_4$, 400 mg PSA, 400 mg C18	AOAC 2007.01	50-pk.	26221
1,200 mg $MgSO_4$, 400 mg PSA, 400 mg C18, 400 mg GCB	AOAC 2007.01	50-pk.	26222
1,200 mg $MgSO_4$, 400 mg C18	similar to AOAC 2007.01	50-pk.	26244
900 mg $MgSO_4$, 150 mg PSA	original unbuffered, European EN 15662	50-pk.	26223
900 mg $MgSO_4$, 150 mg PSA, 15 mg GCB	European EN 15662	50-pk.	26224
900 mg $MgSO_4$, 150 mg PSA, 45 mg GCB	European EN 15662	50-pk.	26225
900 mg $MgSO_4$, 150 mg PSA, 150 mg C18	similar to European EN 15662	50-pk.	26226
900 mg $MgSO_4$, 300 mg PSA, 300 mg C18, 45 mg GCB	similar to European EN 15662	50-pk.	26245
900 mg $MgSO_4$, 300 mg PSA, 150 mg GCB	NA	50-pk.	26126

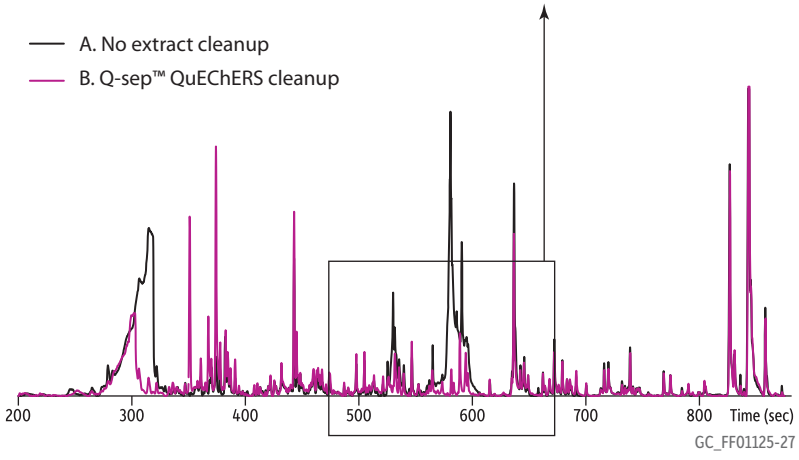
PSA—primary and secondary amine exchange material; GCB—graphitized carbon black

Multiple sorbents are used to extract different types of interferences.

$MgSO_4$	removes excess water
PSA	removes sugars, fatty acids, organic acids, and anthocyanine pigments
C18	removes nonpolar interferences
GCB	removes pigments, sterols, and nonpolar interferences

Use Q-sep™ QuEChERS tubes to easily remove matrix interferences.





GC_FF01125-27

Column	Rxi®-5Sil MS, 20 m, 0.18 mm ID, 0.18 µm (cat.# 43602)
Sample	Sweet potato spiked with pesticide mix and extracted with acetonitrile and Q-sep™ QuEChERS EN Method 15662 extraction salts
Injection	
Inj. Vol.:	1.0 µL splitless (hold 1 min)
Liner:	Gooseneck splitless (4 mm) w/deact. wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	72.5 °C (hold 1 min) to 350 °C at 20 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	
Transfer Line Temp.:	300 °C
Analyzer Type:	TOF
Ionization Mode:	EI
Acquisition Range:	45-550 amu
Instrument	Agilent/HP6890 GC
Notes	A. Extract (without cleanup step) acidified with formic acid to pH 5 B. Extract with cleanup using Q-sep™ QuEChERS dSPE cleanup tube (cat.# 26124) acidified with formic acid to pH 5. Scan range: m/z 60, 73, 87, 129, 256 plotted

Q-sep™ 3000 Centrifuge for QuEChERS

- Meets or exceeds requirements of original unbuffered, AOAC, and European QuEChERS methodology.
- Supports 50 mL, 15 mL, and 2 mL centrifuge tubes.
- Small footprint requires less bench space.
- Safe and reliable—UL, CSA, and CE approved; 1-year warranty.

Priced to fit your laboratory's budget, the Q-sep™ 3000 centrifuge is the first centrifuge specifically designed for QuEChERS methodology. This compact, quiet, yet powerful, unit spins at the 3,000 g force required by the European method.

Centrifuge includes 50 mL tube carriers (six), 50 mL conical tube inserts (six), 4-place 15 mL tube carriers (six), and 2 mL tube adaptors (24).

Specifications:

Motor Speed and Force Rating: 4,130 rpm, 3,000 xg
Maximum Capacity with 6-Place Horizontal Rotor: 6 x 50mL tubes, 18 x 15mL tubes, 24 x 2mL tubes
Motor: 1/2 H.P. brushless DC
Nominal Acceleration Time: 45 seconds
Nominal Braking Time: 60 seconds
Timer (electronic): 1 to 30 minutes +/-1%
Requirement: 2.0 or 1.0 amps
Current Voltage Requirement: 115 or 230 (+/-10%) volts
Frequency: 50 / 60 Hz
Centrifuge Protection Breaker: 4 amp resettable
Overall Dimensions: 9"h x 14.5"w x 17"d (22.9cm x 36.8cm x 43.2cm)
Weight: 39 lbs (17.7kg)

Description	qty.	cat.#
Q-sep 3000 Centrifuge, 110V	ea.	26230
Q-sep 3000 Centrifuge, 220V	ea.	26231
Replacement Accessories		
50 mL Tube Carrier for Q-sep 3000 Centrifuge	2-pk.	26232
50 mL Conical Tube Insert for Q-sep 3000 Centrifuge	6-pk.	26249
4-Place Tube Carrier for Q-sep 3000 Centrifuge	2-pk.	26233
2 mL Tube Adaptors for Q-sep 3000 Centrifuge	4-pk.	26234

26230

Dimensions: 9"h x 14.5"w x 17"d
(22.9 cm x 36.8 cm x 43.2 cm)

26232

26233

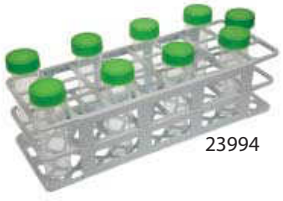
26234

26249

Q-sep™ Tube Racks

- Available for 2 mL, 15 mL, and 50 mL tubes.
- Alphanumerical grid reference on top tier for easy identification of samples.
- Easy to assemble; simply fold and snap together securely.

Description	Size	Material	qty.	cat.#
Q-sep Tube Rack for 2 mL Centrifuge Tube	Holds 100	Polypropylene, White	ea.	23995
Q-sep Tube Rack for 15 mL Centrifuge Tube	Holds 60	Polypropylene, White	ea.	23993
Q-sep Tube Rack for 50 mL Centrifuge Tube	Holds 24	Polypropylene, White	ea.	23994



NEW!

23994

23995

Q-sep™ Bottle Top Solvent Dispenser

- Adjustment knob offers 56 output volume settings from 2.5 mL to 30 mL per stroke (0.5 mL increments)—ideal for QuEChERS methods!
- Base features 30 mm threads and includes four adaptors (25 mm, 28 mm, 38 mm, and 45 mm).
- Individually calibrated in accordance with ISO 8655 standards (certificate included) and can also be recalibrated by the user.
- PTFE, glass, and polypropylene construction for excellent chemical compatibility and 100% autoclavability.
- Integral safety discharge reduces risk of accidental dispensing, and nozzle cap prevents dripping.
- Easy to disassemble for cleaning and servicing.

Accurately and precisely dispense liquids for QuEChERS extractions with this versatile pump. A quick, simple adjustment lets you set the output volume anywhere from 2.5 mL to 30 mL per stroke, and the included adaptors will accommodate most reagent bottles.

Description	qty.	cat.#
Q-sep Bottle Top Solvent Dispenser, 2.5 mL - 30 mL	ea.	23990

NEW!

23990
Bottle not included.

Cut costs, not quality!

NEW! Now available in 4 mm & 30 mm, as well as in PES.

Syringe filters are for laboratory use only.

Syringe Filters with Luer Lock Inlet

- Luer lock inlet offers leak-tight syringe connection.
- Variety of filter types, porosities, and diameters.
- Color coded for easy identification.
- Rugged polypropylene housing.
- Autoclavable to 121 °C for 15 minutes.
- Quantity break pricing for greater savings.

Size	Porosity	Color	qty.	cat.#
Cellulose Acetate				
4 mm	0.22 µm	green	100-pk.	23972
4 mm	0.45 µm	blue	100-pk.	23973
13 mm	0.22 µm	green	100-pk.	26156
13 mm	0.45 µm	blue	100-pk.	26155
25 mm	0.22 µm	green	100-pk.	26158
25 mm	0.45 µm	blue	100-pk.	26157
30 mm	0.22 µm	green	100-pk.	23982
30 mm	0.45 µm	blue	100-pk.	23983
Nylon				
4 mm	0.22 µm	yellow	100-pk.	23970
4 mm	0.45 µm	pink	100-pk.	23971
13 mm	0.22 µm	yellow	100-pk.	26146
13 mm	0.45 µm	pink	100-pk.	26147
25 mm	0.22 µm	yellow	100-pk.	26148
25 mm	0.45 µm	pink	100-pk.	26149
30 mm	0.22 µm	yellow	100-pk.	23980
30 mm	0.45 µm	pink	100-pk.	23981
PES (polyethersulfone)				
4 mm	0.22 µm	white	100-pk.	23978
4 mm	0.45 µm	blue	100-pk.	23979
13 mm	0.22 µm	white	100-pk.	23966
13 mm	0.45 µm	blue	100-pk.	23967
25 mm	0.22 µm	white	100-pk.	23968
25 mm	0.45 µm	blue	100-pk.	23969
30 mm	0.22 µm	white	100-pk.	23988
30 mm	0.45 µm	blue	100-pk.	23989
PTFE (polytetrafluoroethylene)				
4 mm	0.22 µm	purple	100-pk.	23974
4 mm	0.45 µm	orange	100-pk.	23975
13 mm	0.22 µm	purple	100-pk.	26142
13 mm	0.45 µm	orange	100-pk.	26143
25 mm	0.22 µm	purple	100-pk.	26144
25 mm	0.45 µm	orange	100-pk.	26145
30 mm	0.22 µm	purple	100-pk.	23984
30 mm	0.45 µm	orange	100-pk.	23985
PVDF (polyvinyldifluoride)				
4 mm	0.22 µm	brown	100-pk.	23976
4 mm	0.45 µm	red	100-pk.	23977
13 mm	0.22 µm	brown	100-pk.	26150
13 mm	0.45 µm	red	100-pk.	26151
25 mm	0.22 µm	brown	100-pk.	26152
25 mm	0.45 µm	red	100-pk.	26153
30 mm	0.22 µm	brown	100-pk.	23986
30 mm	0.45 µm	red	100-pk.	23987

Table I Membrane selection guide.

Membrane	Properties	Applications	Incompatible with
Cellulose Acetate	hydrophilic	aqueous solutions	organic solvents
Nylon	hydrophilic, low protein binding	bases, HPLC solvents, alcohols, aromatic hydrocarbons	acids, aggressive halogenated hydrocarbons, proteins
PES	hydrophilic, low protein binding, fast flow rates	filtration of buffers & culture media	—
PTFE	hydrophobic	organic solvents, acids, alcohols, bases, aromatics	aqueous samples without pre-wetting (to avoid high backpressure)
PVDF	hydrophilic, low protein binding	alcohols, biomolecules	bases, esters, ethers, ketones

Cellulose Acetate, Nylon, PES, PVDF—hydrophilic applications
PTFE—hydrophobic applications

Thomson SINGLE StEP™ Filter Vials

Save time and reduce waste—these eco-friendly vials replace syringe filtration and eliminate the need for separate vials, caps, syringes, and filters. Remove contaminants and particulates from your HPLC samples with a just a single squeeze!

NEW!

- Fast and easy to use—only hand depression force is required.
- Compatible with both UHPLC and standard HPLC autosamplers.
- Pre-slit caps are color coded for easy identification of membrane and porosity.
- Low dead volume unit contains rugged polypropylene insert with 450 µL loading capacity.

Simply squeeze particulates and contaminants out of your sample!

Porosity	Color	qty.	cat.#
Nylon			
0.2 µm	black cap	200-pk.	23950
0.2 µm	black cap	500-pk.	23951
0.45 µm	pink cap	200-pk.	23952
0.45 µm	pink cap	500-pk.	23953
PES (polyethersulfone)			
0.2 µm	grey cap	200-pk.	23962
0.2 µm	grey cap	500-pk.	23963
0.45 µm	orange cap	200-pk.	23964
0.45 µm	orange cap	500-pk.	23965
PTFE (polytetrafluoroethylene)			
0.2 µm	green cap	200-pk.	23954
0.2 µm	green cap	500-pk.	23955
0.45 µm	blue cap	200-pk.	23956
0.45 µm	blue cap	500-pk.	23957
PVDF (polyvinyldifluoride)			
0.2 µm	red cap	200-pk.	23958
0.2 µm	red cap	500-pk.	23959
0.45 µm	yellow cap	200-pk.	23960
0.45 µm	yellow cap	500-pk.	23961

Patent No. 7,790,117

23950 23952 23962 23964

23954 23956 23958 23960

Accelerated Solvent Extraction (ASE)

Accelerated solvent extraction is a common technique for fast and reliable extraction of organic materials from solid matrices using EPA SW-846 Method 3545, Pressurized Fluid Extraction (PFE). Restek offers a wide range of replacement parts to keep your extraction system running smoothly. All parts are economically priced to save you money and are designed to meet or exceed the performance of the original manufacturer's parts.

NEW!

Replacement Parts for ASE® 150/350 Systems, Manufacturer's Design

Extraction Cell Bodies for ASE® 150/350 Systems

- Cell bodies are serialized for easy sample identification.
- Inner surfaces polished for easier cleaning.

Extraction Cell Body	Similar to Dionex part #	qty.	Stainless Steel cat.#
1 mL for ASE 150/350	068261	ea.	25993
5 mL for ASE 150/350	068262	ea.	25994
10 mL for ASE 150/350	068263	ea.	25995
22 mL for ASE 150/350	068264	ea.	25996
34 mL for ASE 100/300 and 150/350	056646	ea.	26176
66 mL for ASE 100/300 and 150/350	056696	ea.	26178
100 mL for ASE 100/300 and 150/350	056693	ea.	26132

Extraction Cell Caps for ASE® 150/350 Systems

- Inner surfaces polished for easier cleaning.
- Caps include frit, washer, PTFE O-ring, and threaded insert.

Description	qty.	Stainless Steel cat.#
Replacement Extraction Cell End Caps for ASE 150/350	2-pk.	25997

Replacement Parts for ASE® 200 Systems, Manufacturer's Design

Extraction Cell Bodies for ASE® 200 Systems

- Cell bodies are serialized for easy sample identification.
- Inner surfaces polished for easier cleaning.

Extraction Cell Body	Similar to Dionex part #	qty.	Stainless Steel cat.#
1 mL for ASE 200	054973	ea.	26110
5 mL for ASE 200	054974	ea.	26112
11 mL for ASE 200	048820	ea.	26114
22 mL for ASE 200	048821	ea.	26098
33 mL for ASE 200	048822	ea.	26116

Cell bodies are serialized for easy sample identification.

Extraction Cell Replacement Parts for ASE® 200 Systems

- Inner surfaces polished for easier cleaning.
- Caps include frit, washer, PTFE O-ring, and threaded insert.

Description	Similar to Dionex part #	qty.	Stainless Steel cat.#
Replacement Extraction Cell End Caps for ASE 200	049450	2-pk.	26096
Cap Inserts for ASE 200		2-pk.	26166
Replacement Frits for ASE 200	049453	10-pk.	26100
Replacement Frits for ASE 200	049453	100-pk.	25959

Description	Similar to Dionex part #	qty.	cat.#
Snap Rings for Caps for ASE 200	049456	10-pk.	26184
Funnel for ASE 200	056958	ea.	26180
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188

26166

26180

PEEK Washers for ASE® 200 Systems

- Meet original equipment manufacturer's performance.
- Available in four quantities.

Description	Similar to Dionex part #	qty.	cat.#
PEEK Washers for ASE 200	049454	12-pk.	25256
		48-pk.	25257
		250-pk.	26120
		1,000-pk.	26229

25256

20 mm Filters for ASE® 200 Extraction Cells

- Cellulose or glass fiber construction.
- Fit 11mL, 22mL, and 33mL cells.
- Cellulose filters available in economical 1,000-packs.

Description	Similar to Dionex part #	qty.	cat.#
Cellulose Filters for ASE 200	049458	100-pk.	26118
Cellulose Filters for ASE 200	049458	1,000-pk.	26190
Glass Fiber Filters for ASE 200	047017	100-pk.	26119

26119

60 mL Sample Collection Vials for ASE® 200 Systems

- Cleaned, assembled, and ready to use.
- Clear or amber glass.
- Caps and PTFE-lined septa included.

Description	Color	Similar to Dionex part #	qty.	cat.#
60 mL Collection Vials for ASE 200	Clear	048784	72-pk.	26121
60 mL Collection Vials for ASE 200	Amber	048781	72-pk.	26122
Replacement Septa, 24 mm x 0.125", PTFE-lined silicone		—	100-pk.	24694

26122

26121

Replacement Parts for ASE® 100/300 Systems, Manufacturer's Design


26167


26169

Extraction Cell Bodies for ASE® 100/300 Systems

- Cell bodies are serialized for easy sample identification.
- Inner surfaces polished for easier cleaning.

Extraction Cell Body	Similar to Dionex part #	qty.	Stainless Steel cat.#
10 mL for ASE 100	059793	ea.	26172
34 mL for ASE 100/300 and 150/350	056646	ea.	26176
66 mL for ASE 100/300 and 150/350	056696	ea.	26178
100 mL for ASE 100/300 and 150/350	056693	ea.	26132


26187

Extraction Cell Replacement Parts for ASE® 100/300 Systems

- Inner surfaces polished for easier cleaning.
- Caps include frit, washer, PTFE O-ring, and threaded insert.

Description	Similar to Dionex part #	qty.	Stainless Steel cat.#
Replacement Extraction Cell End Caps for ASE 300	056921	2-pk.	26170
Cap Inserts for ASE 300		2-pk.	26167
Replacement Frits for ASE 100/300		6-pk.	26174


26174


26188

Description	Similar to Dionex part #	qty.	cat.#
Snap Rings for Caps for ASE 100/300	056778	12-pk.	26134
Funnel for ASE 100/300	056699	ea.	26169
PTFE O-Rings for ASE 200 & ASE 300 Caps	049457	100-pk.	26187
Viton O-Rings for ASE 200 & ASE 300 Caps	056325	50-pk.	26188


25393

PEEK Washers for ASE® 100/300 Systems

- Meet original equipment manufacturer's performance.
- Available in two quantities.

Description	Similar to Dionex part #	12-pk.	48-pk.
PEEK Washers for ASE 100/300	061687	25393	25394


26168

30 mm Filters for ASE® 100/300 Extraction Cells

- Cellulose or glass fiber construction.

Description	Similar to Dionex part #	qty.	cat.#
Cellulose Filters for ASE 100/300	056780	100-pk.	26168
Glass Fiber Filters for ASE 100/300	056781	100-pk.	26189


26191 26260

250 mL Sample Collection Bottles for ASE® 100/300 Systems

- Cleaned, assembled, and ready to use.
- Clear or amber glass.
- Caps and PTFE-lined septa included.

Description	Color	Similar to Dionex part #	qty.	cat.#
250 mL Collection Bottles for ASE 100/300	Clear	056284	12-pk.	26191
250 mL Collection Bottles for ASE 100/300	Amber	—	12-pk.	26260
Replacement Septa, 24 mm x 0.125", PTFE-lined silicone		—	100-pk.	24694

Valves for ASE® 100/200/300 Systems

- Fits ASE® 100, 200, 300 systems.
- Meets original equipment manufacturer's performance.

Description	Similar to Dionex part #	qty.	cat.#
Pressure Relief Valve for ASE 100/200/300	048889	ea.	26159
Static Valve for ASE 100/200/300	048778	ea.	26160

26159

26160

Autoseal Tip Assembly for ASE® 200/300 Systems

- Meets original equipment manufacturer's performance.
- Choose original equipment-equivalent stainless steel, or Siltek® deactivation for improved inertness and extended lifetime.

	Similar to	Stainless Steel		Siltek Treated	
Description	Dionex part #	qty.	cat.#	qty.	cat.#
Autoseal Tip Assembly for ASE 200	048811	ea.	26162	ea.	26161
Autoseal Tip Assembly for ASE 300	056641	ea.	26246	ea.	26247

26162

26161

Tubing Assembly for ASE® 200/300 Systems

- Great value and improved design.
- Eliminates the need for the adaptor fitting on the static and purge valves.

Description	Similar to Dionex part #	qty.	cat.#
Tubing Assembly for ASE 200	049311	ea.	26251
Tubing Assembly for ASE 300	057059	ea.	26248

26251

Cell Organizer for ASE® Parts

- Convenient storage of extraction cell parts and consumables.
- Thirteen open bins provide easy visibility and organization for small and large pieces.
- Small footprint conserves valuable lab bench and drawer space.

Description	qty.	cat.#
Cell Organizer for ASE Parts, blue 13-bin unit, 12" L x 12" H x 7.5" D	ea.	23998

23998

Carrier Basket for ASE® Cells

- Sturdy stainless steel construction to carry full or empty ASE® cells and caps.
- Can hold twelve complete 33 mL cell assemblies and more of smaller sizes.

Description	qty.	cat.#
Carrier Basket for ASE Cells	ea.	23996

23996


26181


26182


26183

Resprep® Tools for ASE® Systems

- Use to insert filter in extraction cell or O-ring in cell cap.
- Fits all extraction cells, except 1 mL size.

Inserting a Filter Using Filter Insertion Attachment on Resprep® Tool Handle
(ASE® 100/200/300 systems)


Screw the appropriate size attachment onto the end of the Resprep™ tool handle.


Place a filter at the top of the extraction cell.


Push the filter to the bottom of the extraction cell.

Inserting an O-Ring Using Resprep® Tool Handle
(ASE® 100/200/300 systems)


Place the O-ring over the tip of the tool.


Insert the tool into the center hole of the extraction cell cap.


Press the tool firmly inside the cap until the O-ring snaps into place.

Description	qty.	cat.#
2-in-1 Filter/O-Ring Insertion Tool Kit for ASE 100/200/300 (includes Resprep Tool Handle and Filter Insertion Attachments)	kit	26181
Resprep Tool Handle for ASE 100/200/300	ea.	26182
Filter Insertion Attachments (1 mL, 5 mL, 11 mL, 33 mL) for ASE 100/200/300	4-piece set	26183


26185

Retaining Ring Pliers for ASE® 100/200/300 Systems

- Can be used for internal or external retaining rings.
- Works to remove retaining ring in all ASE® cell caps.

Description	qty.	cat.#
Retaining Ring Pliers for ASE 100/200/300	ea.	26185


23999

Cell Cleaning Brushes for ASE® 100/200/300 Cells

- Firm nylon bristle brushes for easy cell cleaning and removal of solid samples.
- Range of sizes to fit all extraction cells for ASE® 100, 200, and 300.

Description	qty.	cat.#
Cell Cleaning Brushes	3-pk.	23999

Glassware

Burets

Auto-Zero Burets with PTFE Stopcock and Reservoir, Class A

Precision-grade white graduations. Supplied with bottle and bulb.

Description	Volume	qty.	cat.#
Auto-Zero Buret w/1,000 mL Reservoir	25 mL	kit	23377
Auto-Zero Buret w/2,000 mL Reservoir	50 mL	kit	23378

Squeeze-O-Matic (S-O-M) Buret with Poly Bottle and PTFE Plug

Description	Volume	Color	qty.	cat.#
S-O-M Buret, PTFE Plug	10 mL	white	kit	23379
S-O-M Buret, PTFE Plug	25 mL	white	kit	23380


23377


23379

Evaporator Apparatus

Kuderna-Danish Evaporator Concentrator

This apparatus is used to concentrate analytes from volatile solvents. Apparatus consist of a 3-ball Snyder distilling column, flask and concentrator tube. The flask and receivers are held together by ST joints and the included poly joint clamp. Concentrator tube is graduated.

Description	Volume	Receiver Capacity	qty.	cat.#
Kuderna-Danish Evaporator	250 mL	10 mL	kit	23339
Kuderna-Danish Evaporator	500 mL	15 mL	kit	23340

Concentrator Tube

Description	Volume	Taper Size	qty.	cat.#
Graduated Concentrator Tube	10 mL	19/22	ea.	23341


23339


23341


23343


23345


23350


23365


23352


23356

Extraction Apparatus

Soxhlet Extraction Apparatus

Soxhlet extraction is used for the continuous solvent extraction of organic analytes from a solid matrix. All parts are connected with ST joints to reduce any risk of contamination. All flask joints are ST 24/40 joints.

Description	ID	Volume	Taper Size	qty.	cat.#
Extraction Apparatus	30 mm	125 mL	34/45	kit	23342
Extraction Apparatus	40 mm	250 mL	45/50	kit	23343
Extraction Apparatus	50 mm	300 mL	55/50	kit	23344

Flasks

Erlenmeyer Flasks w/Stopper

ST outer joint.

Description	Volume	Taper Size	qty.	cat.#
Erlenmeyer Flask w/Stopper	125 mL	24/40	ea.	23345
Erlenmeyer Flask w/Stopper	250 mL	24/40	ea.	23346
Erlenmeyer Flask w/Stopper	500 mL	24/40	ea.	23347
Erlenmeyer Flask w/Stopper	1,000 mL	24/40	ea.	23348

Erlenmeyer Flasks w/Stopper, Iodine Style

Full-length ST joint, funnel top, and hollow stopper with closed bottom.

Description	Volume	Taper Size	qty.	cat.#
Erlenmeyer Flask w/Stopper, Iodine Style	125 mL	24/40	kit	23349
Erlenmeyer Flask w/Stopper, Iodine Style	250 mL	24/40	kit	23350
Erlenmeyer Flask w/Stopper, Iodine Style	500 mL	24/40	kit	23351

Volumetric Flasks, Class A, ST Stopper

Calibrated to contain, with marking spot and ST stopper. Precision grade and "unserialized" flasks that meet the requirements for type 1, Class A, Federal Specification NNN-F-289, and ASTM Specification E 288.

Description	Volume	Taper Size	qty.	cat.#
Volumetric Flask w/Stopper	1 mL*	ST# 9	ea.	23359
Volumetric Flask w/Stopper	5 mL	ST# 9	ea.	23360
Volumetric Flask w/Stopper	10 mL	ST# 9	ea.	23362
Volumetric Flask w/Stopper	25 mL	ST# 9	ea.	23363
Volumetric Flask w/Stopper	50 mL	ST# 9	ea.	23364
Volumetric Flask w/Stopper	100 mL	ST# 13	ea.	23365
Volumetric Flask w/Stopper	200 mL	ST# 16	ea.	23366
Volumetric Flask w/Stopper	250 mL	ST# 16	ea.	23367
Volumetric Flask w/Stopper	500 mL	ST# 19	ea.	23368
Volumetric Flask w/Stopper	1,000 mL	ST# 22	ea.	23369

*The 1 mL flask is test tube shaped and not guaranteed for Class A accuracy.

Volumetric Flasks, Class A, ST Stopper, Amber

Calibrated to contain, with marking spot and ST stopper. Amber stain process provides protection to light-sensitive liquids. Meet the requirements for type 1, Class A, Federal Specification NNN-F-289, and ASTM Specification E 288.

Description	Volume	Taper Size	qty.	cat.#
Volumetric Flask w/Stopper, Amber	10 mL	ST# 9	ea.	23352
Volumetric Flask w/Stopper, Amber	25 mL	ST# 9	ea.	23353
Volumetric Flask w/Stopper, Amber	50 mL	ST# 9	ea.	23354
Volumetric Flask w/Stopper, Amber	100 mL	ST# 13	ea.	23355
Volumetric Flask w/Stopper, Amber	250 mL	ST# 16	ea.	23356
Volumetric Flask w/Stopper, Amber	500 mL	ST# 19	ea.	23357
Volumetric Flask w/Stopper, Amber	1,000 mL	ST# 22	ea.	23358

Flasks, *cont.*

Micro Volumetric Flask, Class A, ST Stopper

The 1 through 5 mL sizes conform to the recommendations of the Committee on Microchemical Apparatus, Analytical Division of the A.C.S., in their 1956 report. Sizes 10 through 50 mL have necks of special design, to allow pipetting to the very bottom of the flask. The wide base gives much greater support to the flask.

Description	Volume	Taper Size	qty.	cat.#
Micro Volumetric Flask w/Stopper	1 mL	ST# 8	kit	23370
Micro Volumetric Flask w/Stopper	2 mL	ST# 8	kit	23372
Micro Volumetric Flask w/Stopper	5 mL	ST# 8	kit	23373
Micro Volumetric Flask w/Stopper	10 mL	ST# 13	kit	23374
Micro Volumetric Flask w/Stopper	25 mL	ST# 13	kit	23375
Micro Volumetric Flask w/Stopper	50 mL	ST# 13	kit	23376

23374

Funnels

Separatory Funnels, Squibb Type with PTFE Stopcock

With solid ST stopper.

Description	Volume	Stopcock	qty.	cat.#
Separatory Funnel, Squibb Type	30 mL	2 PTFE	kit	23381
Separatory Funnel, Squibb Type	60 mL	2 PTFE	kit	23382
Separatory Funnel, Squibb Type	125 mL	2 PTFE	kit	23383
Separatory Funnel, Squibb Type	250 mL	4 PTFE	kit	23384
Separatory Funnel, Squibb Type	500 mL	4 PTFE	kit	23385
Separatory Funnel, Squibb Type	1 L	4 PTFE	kit	23386
Separatory Funnel, Squibb Type	2 L	6 PTFE	kit	23387


23382

Pipettes

Automatic, Repeating Pipettes

Delivers identical amounts of liquid in rapid succession by tilting dispenser to the rear, allowing reagent to fill the calibrated section of pipette from Erlenmeyer flask. The head and flask are held together by ST joints and the included poly joint clamp. Accuracy within 2%.

Description	Volume	Taper Size	qty.	cat.#
Repeating Pipette w/250 mL Reservoir	1 mL	24/40	kit	23390
Repeating Pipette w/250 mL Reservoir	5 mL	24/40	kit	23391
Repeating Pipette w/500 mL Reservoir	10 mL	24/40	kit	23392
Repeating Pipette w/500 mL Reservoir	15 mL	24/40	kit	23393
Repeating Pipette w/500 mL Reservoir	20 mL	24/40	kit	23394
Repeating Pipette w/1 L Reservoir	25 mL	24/40	kit	23395


23392

Stopper

ST Hollow Stopper

Pennyhead, full-length glass apparatus stopper with closed bottom.

Description	Taper Size	qty.	cat.#
ST Hollow Stopper	24/40	ea.	23338


23338

Air Sampling

Air Canisters for VOC Monitoring

SilcoCan® & TO-Can® Air Sampling Canisters

- Get high performance canisters from the innovators of fused silica coating technology.
- Variety of options available, including SUMMA can equivalent.
- Standard fittings compatible with all instrumentation and accessories.
- Exclusive manufacturer of 1 L spherical canister.
- Repair service available to extend canister life.

Canister Options	
Sizes	1, 3, 6, 15 L
Valves	Parker® diaphragm, Swagelok® bellows
Interior Coating	Electropolished, Siltek® treated
Gauges	3 vacuum/pressure ranges

Applications	
Ambient Air	U.S. EPA TO-14A, TO-15, IP-1A, ASTM D5466, OSHA PV 2120, NJ DEP Low Level TO-15
Indoor Air	IP-1A, NJ DEP Low Level TO-15
Vapor Intrusion	
Emergency Response	

Dimensions/Weights of Air Canisters

Can Volume	Dimensions (height x sphere diameter)		Weight	
1 liter	8.5 x 5.25"	21.6 x 13.3 cm	2.5 lb	1.13 kg
3 liter	11.5 x 7.25"	29.2 x 18.4 cm	4 lb	1.81 kg
6 liter	12.5 x 9.25"	31.8 x 23.5 cm	7 lb	3.18 kg
15 liter	17 x 12.25"	43.2 x 31.1 cm	13 lb	5.90 kg

See **pages 398–399** for canister product listings or go to **www.restek.com/air** for more air monitoring products and solutions.

did you know?

SilcoCan® and TO-Can® canisters are cleaned prior to shipping.

- Excellent stability for long-term storage of sulfur-containing volatile organic compounds.
- More accurate sampling.

Anatomy of a SilcoCan® Canister

Optional gauge
- Quickly confirm vacuum or pressure inside canister.
- Monitor pressure changes.
- Fully protected by canister frame.
- Can be heated to 110 °C during cleaning.

Newest surface technology
To ensure sample stability, SilcoCan® canisters are deactivated with innovative Siltek® surface treatment, which chemically bonds a fused silica layer to the metal inner surface of the canister. This layer offers unsurpassed inertness for active compounds, including polar and sulfur-containing molecules. It will not crack, chip, or flake off, despite harsh handling in the field or during transport.

Enhanced valve and canister bracket
Canister holder and valve bracket protect canister, tube stub, and valve.

1/4" tube stub
Allows user to interchange valves.

Serial-controlled label
For quick, sure identification.

Custom Coatings Available from Restek

- **Siltek®**—The ultimate passivation of treated surfaces, from glass to high nickel alloys of steel; ideal for sulfurs, automotive exhaust testing, or stack gas sampling.
- **Sulfinert®**—A required treatment for metal components when analyzing for parts-per-billion levels of organo-sulfur compounds.
- **Silcosteel®-CR**—A corrosion-resistant layer that increases the lifetime of system components in acidic environments containing hydrochloric acid, nitric acid, or seawater.

24182

Canisters are the gold standard for ambient VOC monitoring.

Call for volume discounts!

Get the ultimate insurance plan—order your SilcoCan® canister with a Siltek®-treated valve.

SilcoCan® Air Sampling Canisters

Ideal for low-level reactive sulfur (1-20 ppb), TO-14A, or TO-15 compounds

- High quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms.
- Sizes to support a wide range of sampling needs.
- 2-port or 3-port valve available; 3-port valve includes -30" Hg/60 psi vacuum/pressure gauge (other gauges available).
- Unsurpassed inertness, even for sulfur-containing or brominated compounds.
- For critical applications, order a Siltek®-treated valve—add suffix "-650" to the catalog number of the canister.

Features	Benefits
Siltek® treated.	High inertness—ensures sample stability.
High-purity, 2/3-turn valve with stainless steel diaphragms.	No sample adsorption at the valve, for more accurate results; easy to use.
Vacuum/pressure gauge (optional).	Ascertain internal conditions at a glance.
Variety of sizes.	Meet extensive range of sampling needs.
Stable to 250 °C.	Heat canister to 250 °C for superior cleaning.
Siltek®-treated valve available (add suffix "-650" to cat.#).	Completely passive sample pathway for maximum sample stability.

Whether you are monitoring for TO-14A, TO-15, or reactive sulfur compounds, SilcoCan® canisters are your best choice for inertness. In Tedlar® bags, the stability of low-level (100 ppbv) sulfur volatile organic compounds (VOCs) is poor, even within 24 hours of sampling. Sulfur compounds react with the metal surface in electropolished canisters, so these canisters are unsuitable for collecting and storing low-level sulfur VOCs. SilcoCan® air sampling canisters, which feature a Siltek®-treated surface, offer excellent storage stability for sulfur VOCs at very low levels (1–20 ppbv), under dry or humid conditions. The versatility of the SilcoCan® canister makes it an excellent choice for collecting and storing TO-14A or TO-15 compounds.

	1 L Volume		3 L Volume		6 L Volume		15 L Volume	
Description	**cat.#**		**cat.#**		**cat.#**		**cat.#**	
w/ Parker Diaphragm Valve	24180		24181		24182		24183	
w/ Parker Diaphragm Valve, Siltek Treated	24180-650		24181-650		24182-650		24183-650	
w/ Parker Diaphragm Valve, and Gauge*	24140		24141		24142		24143	
w/ Parker Diaphragm Valve, Siltek Treated, and Gauge*	24140-650		24141-650		24142-650		24143-650	
without Valve	22090		22091		22092		22093	

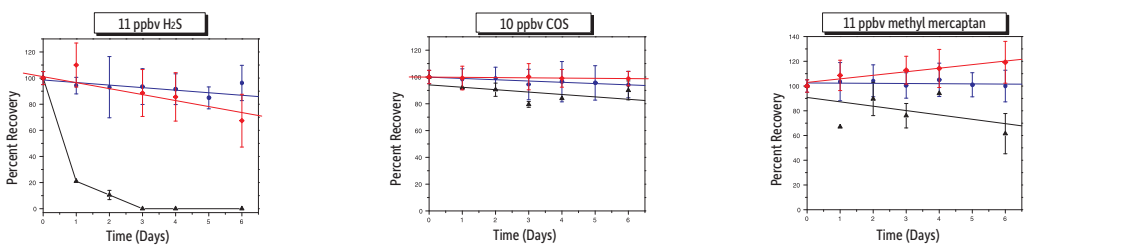
*Range of standard gauge is -30" Hg to 60 psi.

Do not exceed canister maximum pressure of 40 psig.

also available

See **pages 402–423** for sampling kits, sampling bags, and a range of gas reference standards to meet your environmental gas sampling requirements.

SilcoCan® canisters effectively store very low levels of sulfur compounds.



Standards: Dry standards were made by adding 2 mL of a 100 ppm stock sulfur standard to each precleaned and evacuated canister, then pressurizing to 30 psi with ultra-pure nitrogen. Humidified standards were made by injecting 100 µL of deionized water into the evacuated canisters prior to adding 2 mL of stock standard. This produced 50% RH.
GC Column: Rtx®-1 , 60 m, 0.53 mm ID, 7.0 µm; Detector: Sievers Model 355 Sulfur Chemiluminescence Detector

TO-Can® Air Sampling Canisters

Optimized for Methods TO-14A, TO-15, IP-1A, ASTM D5466, OSHA PV 2120, and NJ DEP Low Level TO-15

- Proprietary electropolished surface that maintains compound stability.
- High quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms or Bellows design.
- 2-port or 3-port valve available for diaphragm valve; 3-port valve includes -30" Hg/60 psi vacuum/pressure gauge (other gauges available).

Features	Benefits
Metal to metal seat, valve with stainless steel diaphragms.	No sample adsorption for more accurate results.
Vacuum/pressure gauge (optional).	Ascertain internal conditions at a glance.
Variety of sizes.	Meet a range of sampling needs.
Stable to 250 °C.	Heat canister to 250 °C for superior cleaning.

U.S. EPA Methods TO-14A and TO-15 regulate the collection, storage, and analysis of volatile organic compounds (VOCs) using treated air sampling canisters. Restek offers a complete line of TO-Can® canisters (SUMMA can equivalent), electropolished using a proprietary process and extensively cleaned using an ultrasonic method. This ensures a high-quality, passivated surface that maintains the stability of TO-14A/TO-15 compounds during storage. The frame surrounds the electropolished canister, eliminating the need for weld marks on the sphere, thereby preventing active sites on the canister. The Parker® Hannifin metal-to-metal diaphragm valve supports the excellent performance of the canister.

The unique holder attaches the handle and base to the canister without welds and protects the canister, tube stub, and valve. The 2/3-turn diaphragm valve has a metal-to-metal seat and a temperature limit of 250 °C. We leak-check the system with helium to ensure the TO-Can® canister and valve are leak-tight, then pressurize the canister with contaminant-free nitrogen before we ship it.

	1 L Volume	3 L Volume	6 L Volume	15 L Volume
Description	cat.#	cat.#	cat.#	cat.#
w/ Parker Diaphragm Valve	24172	24173	24174	24175
w/ Parker Diaphragm Valve, and Gauge*	24176	24177	24178	24179
w/ Swagelok SS4H Bellows Valve	22105	22106	22107	22108
without Valve	22094	22095	22096	22097

*Range of standard gauge is -30" Hg to 60 psi.

Do not exceed canister maximum pressure of 40 psig.

Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is -30" Hg to 60 psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

Gauge	Suffix
-30" Hg/15 psi	-651
-30" Hg/30 psi	-652

*No price difference for these substituted gauges.

24173

22107

please note

- SUMMA canister equivalent.
- Excellent analyte recovery—even after 14 days of storage.

did you know?

TO-Can® canisters are cleaned prior to shipping.

Quickly confirm vacuum or pressure. Request a high-quality gauge mounted on your SilcoCan® or TO-Can® canister.

free literature

A Guide to Whole Air Canister Sampling:
Equipment Needed and Practical Techniques for Collecting Air Samples

Ambient air sampling involves collecting a representative sample of ambient air for analysis. There are two general approaches: 1) "whole air" sampling with canisters or Tedlar® bags and 2) "in-field concentration" sampling using sorbent tubes or cold traps. In this guide, we focus on collecting whole air samples in canisters, a flexible technique with many applications.

Download your free copy from **www.restek.com**

Technical Guide
lit. cat.# EVTG1073A

Valves and Gauges for Air Sampling Applications

24144

Replacement Parker® Diaphragm Valves

(Stainless Steel & Siltek® Treated) for Air Sampling Canisters*

- High quality, metal-to-metal seal, 2/3-turn valve with stainless steel diaphragms.
- 2-port or 3-port valve available.

	Stainless Steel Valve	Siltek-Treated Valve
Description	**cat.#**	**cat. #**
1/4" Replacement Valve (2-port)	24145	24144
1/4" Replacement Valve (3-port)	24147	24146

*All Restek canisters are originally equipped with high-quality Parker Hannifin diaphragm valves. Each valve is helium leak-tested. The all-stainless steel construction eliminates contamination and withstands temperatures from -100 °C to 250 °C. All valves have 1/4" compression inlet and outlet connections. 3-Port valves also include an 1/8" female NPT port for a gauge.

24148

Replacement Swagelok® SS4H Bellows Valve

- All metal flow path prevents sample adsorption, giving more accurate results.
- Unique serial number on each valve for complete traceability.
- Withstands temperatures of up to 300 °C.
- Rugged performance in the field.
- Fast delivery from Restek!

Restek offers Swagelok® SS4H canister valves. These popular, rugged valves are available separately or already assembled on our TO-Can® canisters. Valves are bellows-sealed for durability and meet all EPA requirements for air monitoring by methods TO-14A and TO-15.

Description	qty.	cat.
Replacement 1/4" Swagelok SS4H Bellows-Sealed Valve (2-port)	ea.	24148

Replacement 1/4" Swagelok SS4H bellows-sealed valves are available on SilcoCan canisters as a custom product. Contact Technical Service for more information.

24108

Replacement Combination Vacuum/Pressure Gauges

2-inch vacuum/pressure gauges, 316 stainless steel with 1/8" NPT fitting and center back mount. Recommended for use with canisters.

Description	qty.	cat.#
-30" Hg/15 psi Vacuum/Pressure Gauge	ea.	24100
-30" Hg/30 psi Vacuum/Pressure Gauge	ea.	24104
-30" Hg/60 psi Vacuum/Pressure Gauge	ea.	24108

Alternative Mounted Vacuum/Pressure Gauges

The standard vacuum/pressure range on a SilcoCan® or TO-Can® canister fitted with a gauge is -30" Hg to 60 psi. To have a different gauge mounted on your canister, add the appropriate suffix number to the canister catalog number.*

Gauge	Suffix
-30" Hg/15 psi	-651
-30" Hg/30 psi	-652

*No price difference for these substituted gauges.

24120

Vacuum Gauges

High-quality vacuum gauges with 316 stainless steel wetted surfaces. -30" Hg to 0" Hg. Recommended for use with passive sampling kits. All are rear mount.

Description	Fittings	qty.	cat.#
2" Vacuum Gauge	1/8" NPT	ea.	24269
2" Vacuum Gauge	1/4" NPT	ea.	24270
1 1/2" Vacuum Gauge	1/8" NPT	ea.	24120

Ashcroft® Test Gauges

- Accurate measurement of vacuum to -30" Hg and pressure to 60 psi.
- Available in both analog and digital formats.
- Accuracy to +/- 0.25%.
- Gauge connector to canister valve available.

High-accuracy test gauges are recommended for verifying the vacuum/pressure in canisters before and after sampling. The 6-inch face on the analog gauge allows for easy reading. The digital gauge operates on two AAA batteries and offers an unambiguous readout. Both gauges have an accuracy of +/- 0.25% and all metal wetted parts.

Description	qty.	cat.#
Analog Test Gauge, 6" diameter, 1/4" NPT	ea.	24285
Digital Test Gauge, 3" diameter, 1/4" NPT	ea.	24268
Ashcroft Gauge Connector to Canister Valve, stainless steel, connects 1/4" male NPT to 1/4" male compression fitting	ea.	22121

24285

24268

Choose the Appropriate Device for Your Sampling Needs

	Canister	Gas Sampling Bag	Desorption Tube
Media Type	whole air	whole air	adsorption
Sensitivity	ppb	ppm	ppm
Technique	passive (no pump)	active	active
Sample Type	grab or integrated	grab	integrated
Analyte	wide range of VOCs	wide range of VOCs & permanent gases	sorbent specific
Applications	ambient, IAQ, emergency response, IH	ambient, IAQ emission	IAQ, IH
Durability	reusable	one time use	one time use
Inertness	excellent	fair	fair
Stability	30 day	48 hrs	varies by analyte
Sample Volume	0.4–6 L	0.5–100 L	varies by analyte
Sampling Time	minutes to days	minutes to hours	minutes to hours

See pages 398–399 for canisters. See page 412 for gas sampling bags.
See page 414 for canister and thermal desorption tube comparison.

Passive Air Sampling Kits

also available

- See **page 410** for miniature air sampling kits.
- See **page 409** for canister and flow controller repair service.

Passive Air Sampling Kits—Integrated (Stainless Steel & Siltek® Treated)
Superior Performance—an Excellent Restek Value

- Provide accurate integrated sampling without a sampling pump.
- Siltek®-treated components ensure accurate sampling of active components.
- Excellent for sampling times from 0.5 hour to 125 hours.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples and is easy to assemble for field sampling.* The improved filter design greatly reduces the number of potential leak sites.

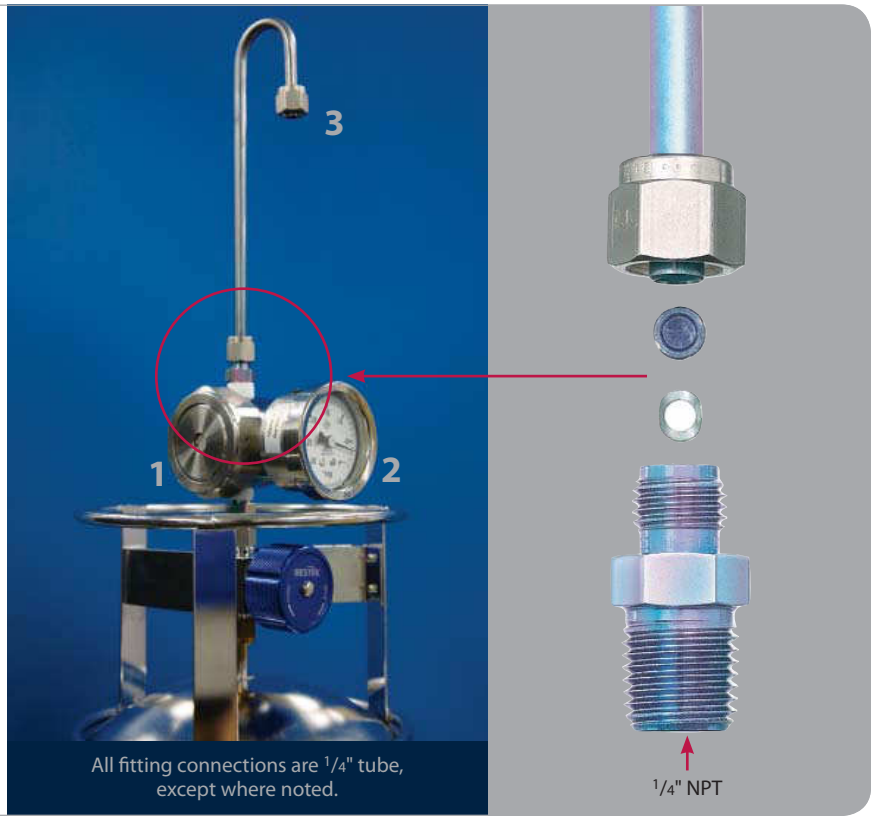
The passive air sampling kit is available in seven sampling flow ranges and in stainless steel or Siltek®-treated finish. The stainless steel kit is ideal to partner with the Restek TO-Can® air sampling canister for TO-14A and TO-15 methods. Use the Siltek®-treated version with the Restek SilcoCan® air sampling canister when collecting low-level volatile sulfur compounds, or other active compounds.

Canister Volume*/Sampling Time					Flow	Orifice Size	Siltek-Treated Sampling Kits	Stainless Steel Sampling Kits
400 cc	1 Liter	3 Liter	6 Liter	15 Liter				
8 hour	24 hour	48 hour	125 hour	—	0.5–2 mL/min	0.0008"	24217	24216
2 hour	4 hour	12 hour	24 hour	60 hour	2–4 mL/min	0.0012"	24160	24165
1 hour	2 hour	6 hour	12 hour	30 hour	4–8 mL/min	0.0016"	24161	24166
—	1 hour	4 hour	8 hour	20 hour	8–15 mL/min	0.0020"	24162	24167
—	—	2 hour	3 hour	8 hour	15–30 mL/min	0.0030"	24163	24168
—	—	—	1.5 hour	4 hour	30–80 mL/min	0.0060"	24164	24169
—	—	—	0.5 hour	1 hour	80–340 mL/min	0.0090"	22101	22100

*Air sampling canisters sold separately.

1. **Veriflo® SC423XL flow controller**
   This flow controller is the heart of the sampling train. It is a high-quality device designed to maintain a constant mass flow as the pressure changes from -30" Hg to 7" Hg (we recommend you stop sampling at or before 7" Hg of vacuum). All wetted parts of the flow controller can be Siltek® treated.
2. **Stainless steel vacuum gauge, 1/8" NPT**
   Fitted to the flow controller, the gauge monitors canister vacuum change during sampling.
3. **1/4-inch Siltek® sample inlet**
   The 0.3 m x 1/4-inch tubing includes a stainless steel nut on the inlet end, to prevent water droplets from accumulating at the edge of the tubing, where they could be pulled into the sampling train.
4. **2-micron frit filter and washer**
   Located prior to the critical orifice to prevent airborne particles from clogging the critical orifice. Replaceable. Available in stainless steel, or Siltek® treated for optimum inertness.
5. **Interchangeable critical orifice**
   An interchangeable ruby critical orifice allows you to control the flow with very high precision.

   Note: All fitting connections are 1/4" tube, except where noted.



Buy only the parts you need!

Replacement Orifices

Use these orifices with a Veriflo® 423XL flow controller to change the flow range for alternative sampling times.

Flow	Orifice Size	Siltek Treated cat.#	Stainless Steel cat.#
0.5–2 mL/min	0.0008"	24219	24218
2–4 mL/min	0.0012"	24233	24245
4–8 mL/min	0.0016"	24234	24246
8–15 mL/min	0.0020"	24235	24247
15–30 mL/min	0.0030"	24236	24248
30–80 mL/min	0.0060"	24237	24249
80–340 mL/min	0.0090"	22099	22098

24249

2 µm Frit Filters

For use in critical orifice fitting. Includes washers.

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
Replacement Frit Filter	3-pk.	24171	24170

24171

24170

Veriflo® Flow Controllers

Veriflo® 423XL flow controllers are offered in a Siltek®-treated and stainless steel version. The flow device is available with or without a critical orifice. (Vacuum gauge sold separately.)

The critical orifice in a Veriflo® flow controller is interchangeable. Order orifices for alternate sampling times, or replacement orifices, separately.

Flow	Orifice Size	Siltek Treated cat.#	Stainless Steel cat.#
0.5–2 mL/min	0.0008"	24232	24229
2–4 mL/min	0.0012"	24255	24260
4–8 mL/min	0.0016"	24256	24261
8–15 mL/min	0.0020"	24257	24262
15–30 mL/min	0.0030"	24258	24263
30–80 mL/min	0.0060"	24259	24264
80–340 mL/min	0.0090"	22103	22102
	without orifice	24238	24239

24262

7 µm In-Line Filter

This 316 stainless steel filter is designed to collect particles larger than 7 microns. We offer Siltek®-treated and stainless steel versions (1/4" compression fitting on both ends).

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
7 µm In-Line Filter	ea.	24265	24266

Note: frit is not replaceable.

24266

Sample Inlets

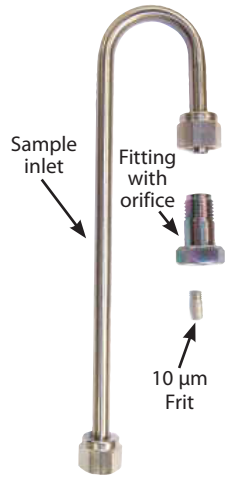
- 1/4" stainless steel compression fitting on each end.
- One end connects to flow controller or canister; nut on other end serves as rain guard.
- Includes nuts and ferrules.
- Two different lengths for use with large canisters and miniature canisters.

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
Sample Inlet, 6" Length	ea.	26210	26209
Sample Inlet, 1.5" Length	ea.	26212	26211

26209

26211

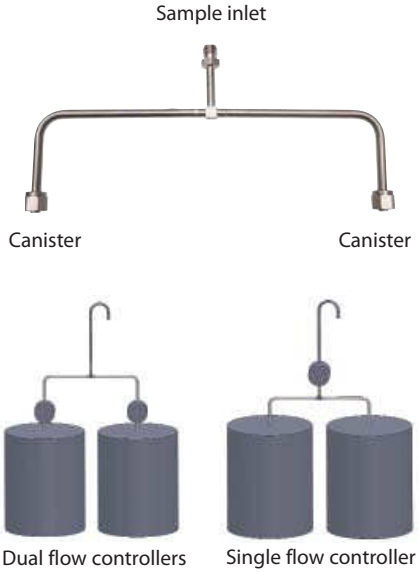
Passive Air Sampling Kits



Unassembled kit components

Assembled kit on canister

Air sampling canisters sold separately.



Passive Air Sampling Kits—Grab (Stainless Steel & Siltek® Treated)

- Use with 1, 3, or 6 L canisters for grab air sampling.
- Variety of orifice sizes for fast sampling from 5 to 60 minutes.
- 1/4" compression fitting connects directly to canister valve inlet.
- Replaceable frit protects orifice and valve from particulates.
- Sample inlet design minimizes water entry into sampling train.
- Individual replacement components available.

Canister Volume/Sampling Time (min)					Siltek-Treated Grab Sampling Kits	Stainless Steel Grab Sampling Kits
1 L Canister	3 L Canister	6 L Canister	Flow	Orifice Size	cat.#	cat.#
60	—	300	15 mL/min	0.0018"	26280	26263
45	—	240	20 mL/min	0.0020"	26281	26264
15	60	120	45 mL/min	0.0030"	26282	26265
10	30	60	80 mL/min	0.0040"	26283	26266
5	15	30	150 mL/min	0.0055"	26284	26267
—	—	15	300 mL/min	0.0080"	26285	26268
—	5	10	390 mL/min	0.0090"	26286	26269
—	3	5	>1,000 mL/min	0.0130"	26287	26270

Air sampling canisters sold separately.

Replacement Fittings for Grab Sampling Kits

Includes fitting and orifice.

Orifice Size	Siltek-Treated Replacement Fitting w/Orifice cat.#	Stainless Steel Replacement Fitting w/Orifice cat.#
0.0018"	26288	26271
0.0020"	26289	26272
0.0030"	26290	26273
0.0040"	26291	26274
0.0055"	26292	26275
0.0080"	26293	26276
0.0090"	26294	26277
0.0130"	26295	26278

Replacement 10 µm Frits for Grab Sampling Kits

Description	qty.	Siltek Treated cat.#	Stainless Steel cat.#
10 µm Frit for Grab Sampling Kit	3-pk.	26296	26279

Dual Canister Sampling Manifold (Stainless Steel & Siltek® Treated)

- Duplicate sampling with all canister sizes using one or two flow controllers.
- Precise dimensions (9.5" wide x 3.5" high) provide accurate splitting of sample between two canisters.
- One-piece design means fewer leaks.
- Thick-walled stainless steel tubing is rugged enough for field use.
- 1/4" compression connections.

Field duplicates of canister samples frequently result in analyte concentrations with high relative standard deviations. In addition, field duplicates do not differentiate laboratory performance from sampling variability. Restek's dual canister sampling manifold (DCSM) minimizes sampling variability through a single sample inlet and flow controller by which the sample is evenly collected between two canisters. Use of a single flow controller eliminates flow rate variability, as well as environmental variables common with collocated samples. The DCSM may also be used with two flow controllers to monitor individual canister vacuum.

Description	Stainless Steel cat.#	Siltek Treated cat.#
Dual Canister Sampling Manifold	24998	24999

Note: Do not use the DCSM as a handle to pick up 2 canisters!

Passive Air Sampling Kits—Soil Gas (Stainless Steel & Siltek® Treated)

This unique grab sampler is specifically designed for soil gas sampling by allowing the connection of tubing coming from the soil gas sample port. The innovative design minimizes connections and leaks and houses a critical orifice in the tee fitting. It also incorporates a vacuum gauge and 2 µm frit filter.

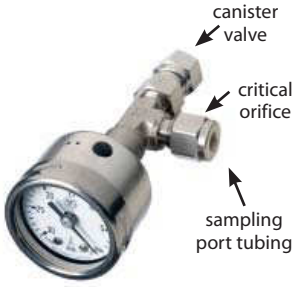
Assembled sampler includes:

- Stainless steel tee with orifice.
- Variety of orifice sizes for sampling from 4 minutes to 10 hours.
- 1 1/2" vacuum gauge (-30" Hg to 0" Hg).
- 2 µm frit filter for insertion into 1/4" compression sample inlet.
- 1/4" port connector to canister valve.

The 1/4" compression inlet and outlet allows easy connection to the canister valve and also to the tubing from the sample port. Several orifice sizes provide sampling times from 4 minutes to 10 hours on a 6 L canister. Individual replacement parts are available, providing a cost-effective alternative to replacing the entire sampler.

Sampling Time for 1 L Canister*	Sampling Time for 6 L Canister*	Flow	Orifice Size	Siltek-Treated Soil Gas Sampler Kit cat.#	Stainless Steel Soil Gas Sampler Kit cat.#	
4 min	20 min	210 mL/min	0.0065"	22935	22930	
6 min	30 min	150 mL/min	0.0055"	22936	22931	
10 min	1 hr	80 mL/min	0.0040"	22937	22932	
30 min	3 hr	30 mL/min	0.0025"	26337	26336	NEW!
45 min	4 hr	19 mL/min	0.0020"	22938	22933	
2 hr	10 hr	6 mL/min	0.0014"	22939	22934	

*Air sampling canisters sold separately.



22930

Assembled kit on canister

Air sampling canisters sold separately.

Replacement Tees w/Orifice for Soil Gas Sampler Kits

Orifice Size	Siltek-Treated Replacement Tee w/Orifice cat.#	Stainless Steel Replacement Tee w/Orifice cat.#	
0.0065"	22945	22940	
0.0055"	22946	22941	
0.0040"	22947	22942	
0.0025"	26339	26338	NEW!
0.0020"	22948	22943	
0.0014"	22949	22944	

22940

Replacement Parts for Soil Gas Sampler Kits

Description	qty.	cat.#
Vacuum Gauge, 1 1/2"	ea.	24120
Replacement Frit Filter, Stainless Steel	3-pk.	24170
Replacement Frit Filter, Siltek Treated	3-pk.	24171
Port Connector, 1/4", Siltek/Sulfinert Treated	ea.	21549
Port Connector, 1/4", Stainless Steel	2-pk.	21936
Nut & Ferrule Set, 1/4", Stainless Steel	5-pk.	21911
Nut, 1/4", Stainless Steel	10-pk.	21902

24120

24171

24170

(Frits do not control flow.)

also available

VCO® Fittings

- Use VCO® fittings for rapid assembly to cleaning system.
- Protect canister valves, flow controllers, and cleaning system fittings.

See **page 294**.

Features	Benefits
Large capacity—holds twelve 6 L cans or twenty-four 1 L cans.	Twice the capacity of other ovens for faster turnaround.
Embedded touch screen controller.	No separate computer needed.
Adjustable oven control up to 110 °C.	Cleans canisters AND valves faster and more completely than heating bands.
Ten user defined methods.	Each cleaning cycle parameter can be configured separately to minimize overall cycle time.
Edwards RV-8 vacuum pump.	Cheaper to run and maintain than 2-pump alternatives.
Vacuum and pressure stainless steel cold traps.	Keeps the system clean—prevents contamination from the pump or dirty canisters.
Humidifier	Provides humidified nitrogen to improve cleaning process.

	Restek	Entech
Capacity	Twelve 6 L cans	Six 6 L cans
Software	Included	Separate

www.restek.com/air

for more info

Download **EVTS1186A-UNV.pdf**
from **www.restek.com**

Specifications:

TO-Clean Oven
Dimensions: 44"H x 48"W x 27"D
Weight: 525 lb
Cart
Dimensions: 29"H x 48"W x 30"D
Weight: 486 lb
Dewar
Weight: 5 lb

TO-Clean Canister Cleaning System High capacity, fully automated, easy-to-use canister cleaning oven dramatically increases lab efficiency.

- EPA Method TO-14A/15 compliant.
- Powerful pump can achieve 50 mTorr in 30 minutes for twelve 6 L canisters.
- Custom-built trays for different canister sizes.
- One-year limited warranty.
- Fully assembled and ready to use.

TO-Clean from Wasson-ECE Instrumentation is a revolutionary canister cleaning system designed to take the guesswork out of canister cleaning. The system is fully automated, allowing the user to start a cleaning cycle and walk away. This is a high-performance system that is easy to use and consistently produces excellent results.

Cut Cleaning Time in Half

Get finished cleaning faster—the high capacity interior holds twice as many canisters as similar models, which lets you finish cleaning in half the time. EPA Method TO-14A/15 compliant unit holds up to twelve 6-liter or twenty-four 1-liter canisters.

Oven Control at Your Fingertips

Isothermal oven cleans both canisters and valves faster and more completely than a heating band system. Temperature is adjustable up to 110 °C.

Easily Create Custom Cleaning Programs

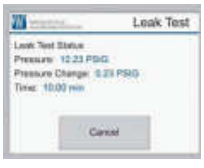
Create up to 10 different methods using the on-board touch screen controller. Define the number of cycles, pressure, and soak times; then save the method for later use. Ensures consistent procedures are followed and makes operation as simple as pressing "start".

Easily create custom methods.

Choose a saved method for a fast start and consistent process.

Ensure Performance with Easy, On-Board Diagnostics

With embedded diagnostic software, you can check for leaks and test valve operation at the touch of a button. Quick and easy system verification ensures effective cleaning. No separate computer needed.



Description	qty.	cat.#
TO-Clean Oven, 120 V, 60 Hz	ea.	22916
TO-Clean Oven, 220/230 V, 50/60 Hz	ea.	22917
Optional Accessories (not included with TO-Clean Oven)	**qty.**	**cat.#**
Oven Cart, 29" H x 48" W x 30" D, 12 gauge steel, push handle and casters	ea.	22919
1 L Option: includes tubing, fittings, and inserts for 24 1 L canisters	ea.	22920
NEW! 3 L Option: includes tubing, fittings, and inserts for 12 3 L canisters	ea.	22126
NEW! Mini-Can Option: includes tubing, fittings, and inserts for either 48 400 cc or 48 1,000 cc mini-canisters	ea.	22127

Shipping: FedEx Ground, unless otherwise requested. Costs vary depending on ship-to location.

Note: Ovens are built on demand; therefore, a ten-week lead time is required on all orders. A limited cancellation and return policy applies to TO-Clean ovens; contact Restek Customer Service for details.

Air Canister Heating Jacket

- Closely simulates oven environment—heats entire canister and valve.
- Two temperature settings, 75 °C and 150 °C.*
- Prevents sample condensation for accurate sub-sampling.
- Easily fits canister up to 6 liters.
- Lightweight; comfortable to the touch when heated.
- Connect up to five canister heating jackets to one 15 amp circuit.

Description	qty.	cat.#
Air Canister Heating Jacket (110 volt)	ea.	24123

*Not CE certified.

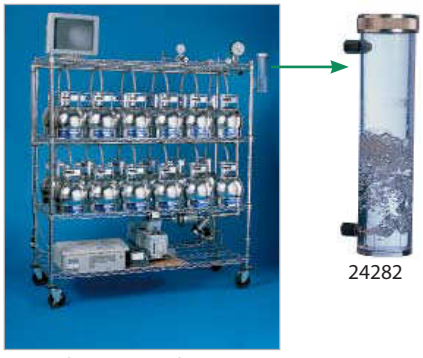
did you know?

After assembly, every Restek SilcoCan® and TO-Can® canister is evacuated to 50 mTorr, then pressurized with humidified nitrogen to 30 psi. The cleaning system is programmed to repeat this cycle two times to ensure thorough cleaning. We ship our canisters clean and under pressure at 30 psi with dry nitrogen.

Humidification Chamber

When cleaning SilcoCan® or TO-Can® canisters, it is important to use humidified air or nitrogen to help remove volatile organic contaminants. We incorporated our humidification chamber into the design of our cleaning system. Restek's humidification chamber is made of acrylic and withstands pressure up to 90 psi. The 1/4-inch inlet and outlet compression fittings allow easy connection to pressure lines on your cleaning system. Our humidification chamber also has an easy-to-open lid for filling with water.

Description	qty.	cat.#
Humidification Chamber	ea.	24282



24282

Restek's canister cleaning system with humidification chamber.

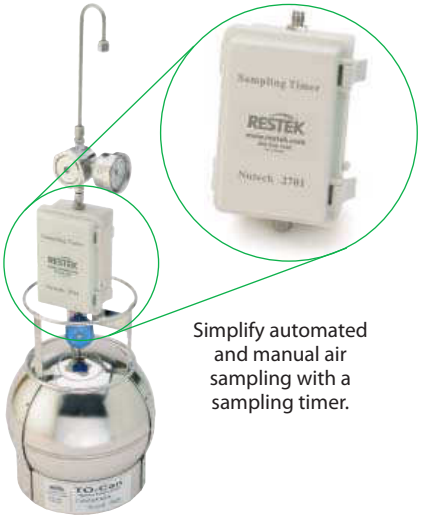
Canister Air Sampling Timer

- Program up to 12 timed events!
- Capable of both manual and automated operation.
- Perfect for either grab- or time-integrated sampling.
- Long battery life; recharges conveniently using the USB port on any PC.
- All stainless steel sample flow path ensures inertness, improving accuracy.

These timers are designed to simplify both automated and manual air sampling. The easy-to-use keypad and graphic display facilitate the programming of up to 12 timed events. They offer the convenience of remote start/stop sampling and permit intermittent sampling throughout a test period. The LCD remains in sleep mode when not in use, greatly extending battery life. Timers are compatible with any canister and flow controller.

Features include: solenoid valve for sampling control, 1/4" inlet and outlet fittings, highly inert stainless steel flow path, and waterproof exterior for outdoor use.

Description	qty.	cat.#
Canister Air Sampling Timer	ea.	24267



Simplify automated and manual air sampling with a sampling timer.

Canister and passive air sampling kit must be purchased separately.

24151

Air Canister Tripod

- Lightweight (9 pounds) and compact for easy storage and transport.
- Extends from 6' to 9' high.
- Large base provides enhanced stability without additional supports.
- Sturdy, rugged metal design for outdoor sampling and transport.

Restek's air canister tripod holds two canisters simultaneously for collocated ambient air sampling. The custom-designed bracket holds most 1, 3, and 6 L canisters securely without any tools.*

Air canister tripod conveniently holds two air canisters.

Description	qty.	cat.#
Air Canister Tripod	ea.	24151

*Air sampling canisters sold separately.

Canister Carrying Supplies

24215

Restek canisters are shipped in boxes with handles for easy transportation.

Canister Carrying Box Kit

6-liter carrying boxes with plastic handles simplify canister transport. These boxes also accommodate our passive sampling kit. Four carrying boxes and one shipping box per kit.

Description	qty.	cat.#
Canister Carrying Box Kit	kit	24215

Canister Carrying Case

- Heavy-duty, all-aluminum design, fits two 6 L SilcoCan® or TO-Can® canisters tightly without foam.
- Weight: 9 pounds.
- Inside dimensions: length 18", width 9 1/8", height 12 1/2" (46 x 23 x 32 cm).
- No organic contaminants from foam or plastics.

Description	qty.	cat.#
Deluxe Canister Carrying Case	ea.	24226

How to Extend Canister Life

What reduces canister performance and longevity? Leakage is the most common reason for canister failure, but contamination and damage to the fused silica lining can also send canisters to the scrap yard prematurely. Here are some tips to protect your investment:

1. Prevent leaks

Use proper handling to avoid these three leading causes of leaks.

a. Particles in the valve

You can prevent particles from entering the valve by always using a 2 or 7 µm particulate filter during sampling and on your canister cleaning equipment. Also, protect the valve inlet by replacing the brass dust cap when not in use. The EPA-recommended metal-to-metal sealing valves provide the greatest inertness, but tend to be more sensitive to particulate damage than other valve types.

b. Galled thread fittings

Avoid galled thread fittings by using a gap gauge to prevent overtightening of compression fittings. Turning only ¼ turn past finger-tight is another rule of thumb to prevent overtightening. Use brass compression fittings on stainless steel during nonsampling activities, such as cleaning or calibration, to minimize thread damage. Galled threads may also cause a poor connection to vacuum/pressure gauges, resulting in inaccurate measurement and the misleading conclusion that canister leakage exists.

c. Overtightened valve

Canister valves are designed to close securely with hand tightening only. Overtightening a valve closure with a wrench may damage the valve seat where the seal is made.

2. Reduce contamination

a. Segregate high concentration level (ppm) cans and trace concentration level (ppb) cans. Use dedicated canisters, or gas sampling bags, for ppm level sampling, since it is extremely difficult to remove impurities from ppm sampling to a level suitable for trace sampling.

b. Clean the entire sampling train as you would the can to minimize introduction of contaminants into a clean can. Maximum temperature is 110 °C on the gauge and 130 °C on Restek's Veriflo® flow controller.

c. High temperature (>100 °C) humidified air (steam cleaning) provides the most effective way to remove contamination from electropolished cans (TO-Can® or SUMMA® canisters), but can damage fused silica lined cans (SilcoCan® canisters). See #3 below for proper cleaning of fused silica lined cans.

3. Avoid damage to fused silica lined cans

Be sure to follow method recommendations when cleaning your canisters to avoid damaging the fused silica lining. Cleaning studies of SilcoCan® canisters using humidified air and heat at 80 °C and 125 °C have shown reduced recoveries of sulfur compounds, when compared to using nitrogen under the same conditions. This irreversible damage is due to oxidation of the surface, creating active sites that may affect the recovery of reactive or polar compounds. Strong acids and bases may also result in damage to the internal can surface.

Canister and Flow Controller Repair Service

Save money and increase performance with Restek's canister and flow controller repair service.

Normal wear and tear on canisters and components can result in damage causing leakage. Restek's repair service allows you to extend the life of your equipment for much less than the cost to replace with new products. Contact Customer Service at 800-356-1688, or your Restek representative, to take advantage of this service. You will be given instructions and an SRV # to return the parts to us.

Sampling Kit/Flow Controller Repair
Includes all new rubber seals in flow controller and orifice and frit replacement
cat.# 550131

Canister Repair
Includes valve replacement, leak test, & cleaning
cat.# 560838

Expand Air Sampling with Mini-Cans & Accessories

- Grab and integrated sampling without a sampling pump.
- 8-hr integrated sample possible with 400 cc mini-can.
- Siltek® coating delivers high level of inertness for H_2S & other reactive compounds.
- Versatile enough for many applications:
  - Indoor air
  - Industrial hygiene
  - Soil gas
  - Emergency response


26252

Miniature Air Sampling Kits (Stainless Steel & Siltek® Treated)

- Provide accurate integrated sampling without a sampling pump.
- Convenient smaller size connects easily to miniature canisters.
- Available in stainless steel or with Siltek® treatment for greater inertness.

Restek's passive air sampling kit incorporates all the hardware necessary to collect air samples and is easy to assemble for field sampling.* Kit includes flow controller, critical orifice, 2 µm frit filter, vacuum gauge, and sample inlet. The gauge (cat.# 24120) and sample inlet (cat.#s 26211, 26212) are downsized for use with smaller canisters.

Canister Volume*/Sampling Time			Orifice	Siltek Treated	Stainless Steel
400 cc	1 Liter	Flow	Size	Sampling Kits	Sampling Kits
8 hour	24 hour	0.5–2 mL/min	0.0008"	26253	26252
2 hour	4 hour	2–4 mL/min	0.0012"	26255	26254
1 hour	2 hour	4–8 mL/min	0.0016"	26257	26256
—	1 hour	8–15 mL/min	0.0020"	26259	26258

*Air sampling canisters sold separately.

Mini-Can Accessories

Sampling Belt:

- Adjustable up to 50".
- Two reclosable hook-and-loop straps securely hold mini-can or other sampling device.
- Straps slide anywhere on belt.
- Versatile design, perfect for personal wear or hang for area sampling.


Sampling belt & personal sample inlet

Personal Sample Inlet:

- 3' long x 1/16" OD all PTFE tubing.
- Convenient clip can be moved along length of tubing for proper attachment in breathing zone.
- PTFE reducing ferrule allows direct connection from 1/16" tubing to 1/4" flow controller without another fitting.

Mini-Can Stand:

- Collapsible for easy storage and transport.
- 2 out of 3 legs move to accommodate uneven surfaces.
- Holds 2 3/4" diameter cans securely.
- Small footprint—12" diameter x 6.5" height.


22124
Mini-Can Stand

Mini-Can and Sampling Kit not included.

These accessories enhance mini-can usage and provide flexibility in their application, from personal, to area, to vapor intrusion sampling.

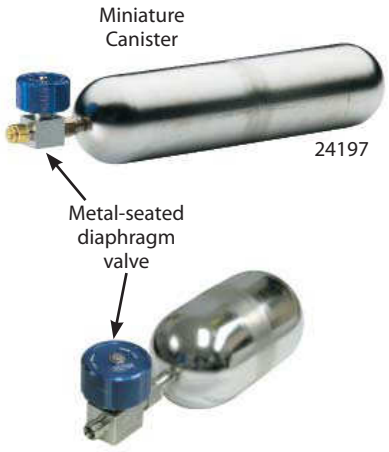
Description	qty.	cat.#
Sampling Belt	ea.	22122
Personal Sample Inlet (includes: 3' x 1/16" OD PTFE tubing, Clip, PTFE Reducing Ferrule, 1/4" SS nut)	ea.	22123
Mini-Can Stand	ea.	22124

Miniature Air Sampling Canisters

- Ideal for indoor air, personal, emergency response, or soil gas sampling.
- 400 cc or 1,000 cc.
- Available with quick-connect fitting that is compatible with sampling and analysis instruments.
- Also available with untreated or Siltek®-treated valve.

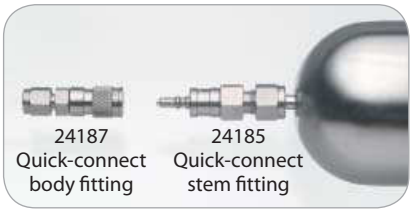
These small canisters are designed for controlled sampling, such as personal air sampling, as an alternative to tube and pump samplers. The 1,000 cc canister is suitable for sampling volatile organic compounds in air according to methods TO-14A, TO-15, IP-1A, ASTM 5466, OSHA PV 2120, and NJ DEP Low Level TO-15.

Restek offers these products in stainless steel or with Siltek® treatment, for greatest inertness. We continue to offer passive coating technologies that are unmatched in the air sampling industry—try a Siltek®-treated canister to achieve the ultimate in analyte stability.



Dimensions:
400 cc = 2.75" diameter, 5.35" long (7 x 13.6 cm)
1,000 cc = 2.75" diameter, 11.92" long (7 x 30 cm)

Description	qty.	400 cc cat.#	1,000 cc cat.#
Miniature Canister with Quick-Connect Stem Fitting			
Electropolished Stainless Steel	ea.	24188	24194
Siltek Treated	ea.	24189	24195
Siltek Treated, with Siltek Treated Quick-Connect Stem Fitting	ea.	24190	24196
Miniature Canister with Parker Diaphragm Valve			
Electropolished Stainless Steel	ea.	24191	24197
Siltek Treated	ea.	24192	24198
Siltek Treated, with Parker Diaphragm Valve, Siltek Treated	ea.	24193	24199
Miniature Canister without Valve			
Electropolished Stainless Steel	ea.	24205	24206
Siltek Treated	ea.	24207	24208



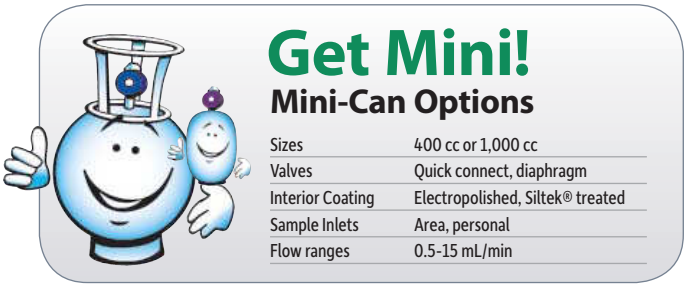
Quick-Connect Fittings for Miniature Air Sampling Canisters

Attach quick-connect body fitting to stem fitting to open canister. Attach quick-connect stem protector to stem fitting when not sampling to prevent canister from accidentally opening.

Connection: 1/4" tube fitting.

Description	qty.	cat.#
Quick-Connect Stem Fitting	ea.	24185
Quick-Connect Stem Fitting, Siltek Treated	ea.	24186
Quick-Connect Stem Protector, Stainless Steel	ea.	24121
Quick-Connect Body Fitting	ea.	24187

Note: Quick-connect body fitting (cat.# 24187) must be ordered separately to sample with quick-connect stem fitting.



tech tip

Use a gap inspection gauge to confirm fittings are sufficiently tightened. See page 297.

Gas Sampling Bags

Sampling bags are a low-cost, whole-air sampling device for high-level VOCs and permanent gases. Several EPA, NIOSH, and OSHA methods exist for bag sampling for a variety of applications: stationary sources emissions, workplace atmospheres, ambient, indoor air quality, and breath analysis. Choose the film type appropriate for your application. All our bags feature a polypropylene combo valve with hose connection to fit $^3/_{16}$" ID tubing and syringe port with replaceable septum. A single eyelet provides handling convenience.

22050 22039

Tedlar® Sampling Bags

- Find the bags you need—we offer sizes from 0.5 liters to 100 liters.
- Unique all-in-one septum and valve fitting make these lightweight and easy to use.
- Polypropylene or stainless steel valve.
- Both valves conveniently connect to $^3/_{16}$" ID PTFE tubing.

			Polypropylene Valve	Stainless Steel Valve
Description		qty.	cat.#	cat.#
0.5 L	6" x 6"	10-pk.	22049	22038
1 L	7" x 7"	10-pk.	22050	22039
3 L	9.5" x 10"	10-pk.	22051	22040
5 L	12" x 12.5"	10-pk.	22052	22041
10 L	11.75" x 22"	10-pk.	22053	22042
12 L	13" x 24"	10-pk.	22054	22043
25 L	17.5" x 24"	5-pk.	22055	22044
40 L	24" x 24.25"	5-pk.	22056	22045
80 L	28.25" x 30.5"	5-pk.	22057	22046
100 L	28" x 36"	3-pk.	22058	22047

Description	qty.	cat.#
PTFE Faced Silicone Replacement Septum, 4 mm diameter	10-pk.	22104

22950

22953

Multi-Layer Foil Gas Sampling Bags

- Good stability for low molecular weight compounds, such as methane, CO, CO_2, and permanent gases.
- Chemically inert with light and moisture protection.
- Not recommended for low ppm VOCs due to background levels.
- 5-layer protective barrier minimizes gas permeability.
  - 60 gauge nylon (outer layer)
  - Metalized aluminum
  - Polyethylene
  - 0.0003" aluminum foil
  - 0.002" polyethylene (inner layer)

Volume	Size	qty.	cat.#
1 L	7" x 7"	5-pk.	22950*
3 L	10" x 10"	5-pk.	22951
5 L	12" x 12"	5-pk.	22952
10 L	12" x 22"	5-pk.	22953
12 L	13" x 24"	5-pk.	22966
25 L	18" x 24"	5-pk.	22967
40 L	24" x 24.5"	5-pk.	22968
PTFE Faced Silicone Replacement Septum, 4 mm diameter		10-pk.	22104

also available

ALTEF gas sampling bags

www.restek.com

Vacuum Bag Sampler

- Fast bag sampling without sample passing through pump.
- Bag capacity up to 10 L.

The model 1062 vacuum bag sampler provides fast sampling with zero cross-contamination. A vacuum created in the box draws air into the sampling bag without drawing it through the vacuum pump first, as is the case with standard air sampling pumps, thereby preventing contamination of the sample. This bag sampler can fill a 10 L bag in two minutes with an automatic shut-off switch, which stops the sample bag from overfilling. The filling rate is adjusted with a vent rotometer valve. An external battery recharging port enables continuous operation with battery charger. In addition, the quick exhaust valve allows for fast removal of the sampling bag. The sampler comes with a universal power adaptor/charger, battery, instruction manual, and 1-year limited warranty.

Specifications:

Sampling Bag:	1 bag up to 10 L size
Running Time:	8 hours
Flow Rate (Fill Rate):	1-5 L/min
Power Requirements:	12 V battery, 4.5 amp
Charge Time:	9 hours
Dimensions:	9" x 14.6" x 21.7"
Weight:	17 lb

22118

Features:

- Observation window on case lid
- Sample inlet accepts 1/4" OD tubing
- Case designed for rugged outdoor use
- CE certified

Description	qty.	cat.#
Vacuum Bag Sampler Model 1062 (includes: power adaptor, battery, manual)	ea.	22118
Replacement Battery for Vacuum Bag Sampler Model 1062	ea.	22119
Universal Battery Charger for Vacuum Bag Sampler Model 1062 (115/230 VAC)	ea.	22120

Physical Specifications of Gas Sampling Bags

	Tedlar® bags	ALTEF Bags	Multi-Layer Foil Bags
Composition	polyvinyl fluoride (PVF) polymer resin	Proprietary PVDF film	5-layer
Thickness	0.002"	0.003"	0.005"
Tensile Strength	8,000 psi	6,100 psi	24 lb/inch (CD)
Max. Operating Temp.	204 °C	150 °C	87 °C
Specific Gravity	1.7 g/mL	1.78 g/mL	1.09 g/mL
Oxygen Permeability	50 cc/m² x day	58 cc/m² x day	0.0006 cc/m²/day
Water Vapor Permeability	9-57 g/m² x day	12-15 g/m² x day	0.0006 g/100 square inches/day
Carbon Dioxide Permeability	172 cc/m² x day	172 cc/m² x day	0.0005 cc/100 square inches/day

General Guidelines for Bag Sampling

Follow these basic considerations for trouble-free air monitoring using gas sampling bags.

Before Sampling

- Store unused bags in a clean environment, sealed in an outer bag to prevent adsorption of contaminants.
- Preclean bags before use by flushing with high-purity nitrogen.
- For validation, compounds must be stable at >80% for 72 hours.
- Leak rate must not exceed 0.1" Hg/min.

During Sampling

- Be sure the PTFE tubing used for bag connection is clean.
- Use a vacuum box sampler for direct bag filling, in order to avoid contamination from a sampling pump.
- 3 L/min is a typical flow rate.
- Do not fill bags more than 80%.

After Sampling

- Bags are intended for a single use, due to potential sample adsorption onto the bag film.
- Hold times are typically 48 hours, unless validation study demonstrates longer stability.
- Protect samples from direct sunlight and store above 0 °C to prevent condensation.
- Transport in rigid, opaque container to prevent bag puncture; do not ship by air unless samples will be kept in a pressurized area.

Thermal Desorption Tubes vs. Canister Sampling

Which VOC Sampling Technique is Right for You?

Thermal desorption tubes provide a complementary option to canisters for sampling VOCs. Both techniques have advantages and disadvantages, and their features must be evaluated for suitability relative to the sampling environment and analytical capabilities. Table I outlines the similarities and differences between these techniques; use this handy comparison to determine which equipment is best for you.

free literature

A Guide to Whole Air Canister Sampling: Equipment Needed and Practical Techniques for Collecting Air Samples

lit. cat.# EVTG1073A

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tech guides

Thermal desorption application guides are available for a broad range of markets. Request your FREE copy today using these part numbers.

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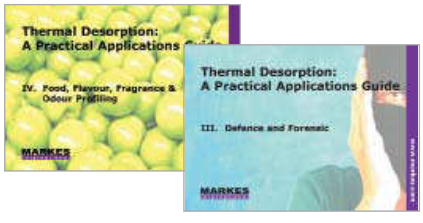


Table I: Comparison of thermal desorption tube and canister sampling for VOCs.

Similarities Between Thermal Desorption Tubes and Canisters

- Reusable sampling device.
- Long product lifetime.
- Long-term sample stability.
- Blank certification required prior to sampling.
- Sample concentration required before GC-MS analysis.
- Dry purge helpful to remove moisture before GC injection.
- ppt sensitivity.
- Method acceptance.
- Collection of wide range of VOCs with single device.
- Useful for screening of unknowns.
- Leak tightness critical to maintaining sample integrity and preventing contamination of a clean device.

Differences Between Thermal Desorption Tubes and Canisters

	Thermal Desorption Tubes	Canisters
Methods	U.S. EPA TO-17 ASTM D6196 ISO 16017 ISO 16000-6 NIOSH 2549	U.S. EPA TO-14A, TO-15 ASTM D5466 OSHA PV2120 NIOSH Protocol Draft
	World-wide acceptance	Gold standard for U.S. ambient air market
Applications	Ambient air, indoor air, industrial hygiene Material emissions Food & flavor Chemical weapons	Ambient air, indoor air, vapor intrusion, emergency response
	C3 to C30	<C3 to ~C10
Handling	Light weight for personal monitoring and general ease of use	Larger and heavier; more costly to ship
Sampling	Active sampling with sampling pump or diffusive sampling without pump is possible with determined diffusion coefficients for each compound.	Passive sampling, no sampling pump required. Long-term sampling possible without battery to recharge.
	Integrated sampling only	Grab & integrated sampling
	Concentrated sample	Whole air
	Proper sorbent selection recommended in methodology.	N/A
	Must sample below sorbent breakthrough volumes to avoid sample loss and irreversible adsorption on sorbent	N/A
	Large sample volumes >100L	Sample volume is function of canister size, 15 L max
Analysis	Tube dimensions are instrument specific	Compatible with all manufacturer sample concentrators
	One injection, more injections possible for some instrumentation	Multiple sample injections
	Concentration range ppt to ppm	ppt to ppm
	Some sorbents prone to artifact formation.	Low blanks when properly cleaned.
Storage	Sample storage at 4 °C recommended for multi-bed tubes to prevent potential migration of compounds to more retentive sorbent, which maybe difficult to recover.	Room temperature
Cleaning	Analytical process automatically cleans tube for reuse. Cleans as it analyzes. Conditioning/cleaning and analysis incorporated in one thermal desorption unit.	Canister cleaning requires separate equipment as additional step prior to background certification and sampling.
Cost	$50–130 each	$200–700 each

Thermal Desorption Unit (TDU) Tubes

- Variety of sorbents to collect a wide range of VOCs.
- Use glass tubes for maximum inertness in active sampling.
- Choose stainless steel tubes for either active or passive sampling. No sampling pump necessary for passive sampling with diffusion caps!
- Individually etched with unique serial number for convenient sample identification.
- Robust barcode—the most reliable "code 128" format—on tube for recording and tracking.
- Each tube has an arrow indicating flow direction to reduce errors during use.
- Available unconditioned or preconditioned and ready to sample. Tubes are reusable after thermal desorption.

High-quality thermal desorption tubes by Markes International are suitable for ppt to ppm concentrations of volatile organic compounds (VOCs) in ambient, indoor, and industrial hygiene environments. Fit Markes (ULTRA and UNITY™), PerkinElmer, and Shimadzu thermal desorbers. Packed tubes come with a report detailing the total mass of sorbent in the tube; conditioned tubes also include a blank chromatogram.

Thermal Desorption Tube Sorbent	Vapor Phase Organics Applications
Tenax TA	C6/7 to C26
Graphitized Carbon	C5/6 to C14
Tenax GR/Carbopack B	*n*-C5/6 to *n*-C20 (EPA Methods TO-14A/TO-15/TO-17)
Carbopack B/Carbosieve SIII	*n*-C2/3 to *n*-C12/14 (EPA Methods TO-14A/TO-15/TO-17)
Tenax TA/Graphitized Carbon/Carboxen 1000	C2/3 to C20
Carbopack C/Carbopack B/Carbosieve SIII	*n*-C2/3 to *n*-C16/20 (EPA Methods TO-14A/TO-15/TO-17)

Tenax is a trademark of Buchem BV. Carbopack, Carbosieve, and Carboxen are trademarks of Sigma-Aldrich.

Thermal Desorption Unit Tubes (Unconditioned and Conditioned & Capped)

		Unconditioned		Conditioned & Capped	
		Stainless Steel	Glass	Stainless Steel	Glass
Description	qty.	cat.#	cat.#	cat.#	cat.#
TDU Tubes, Tenax TA	10-pk.	24056	24062	24080	24086
TDU Tubes, Graphitized Carbon	10-pk.	24057	24063	24081	24087
TDU Tubes, Tenax GR/Carbopack B	10-pk.	24058	24064	24082	24088
TDU Tubes, Carbopack B/Carbosieve SIII	10-pk.	24059	24065	24083	24089
TDU Tubes, Tenax TA/Graphitized Carbon/Carboxen 1000	10-pk.	24060	24066	24084	24090
TDU Tubes, Carbopack C/Carbopack B/ Carbosieve SIII	10-pk.	24061	24067	24085	24091

Thermal Desorption Unit Tubes (Empty)

- Empty tubes for direct desorption of VOCs in liquids, solids, or pastes.
- Stainless steel: front sorbent-retaining gauze, rear gauze and gauze retaining spring supplied, or glass: with glass frit positioned 15 mm from sampling end.

		Stainless Steel	Glass
Description	qty.	cat.#	cat.#
TDU Tubes, Empty	10-pk.	24054	24055

Thermal Desorption Unit Tubes (Calibration)

		Stainless Steel	Glass
Description	qty.	cat.#	cat.#
TDU Tubes, Calibration, Tenax TA 1 cm Bed	10-pk.	24075	24076

Description	qty.	cat.
Calibration Solution Loading Rig	ea.	24077
Calibration Solution Loading Rig Replacement Septa, 9.5 mm	10-pk.	24078
Certified Reference Standard, 100 ng BTX on Tenax TA	10-pk.	24079

Thermal Desorption Unit Tubes (Accessories)

Description	Benefits/Uses	qty.	cat.
1/4" Brass Cap and PTFE Ferrules	Long-term storage of blank/sampled tubes.	20-pk.	24068
1/4" PTFE Ferrules	Long-term storage caps.	20-pk.	24069
CapLok Tool	Use for tightening long-term storage caps.	ea.	24070
Pen Clip		10-pk.	24071
TubeMate Tool	Assists with tube packing.	ea.	24072
1/4" Stainless Steel Union and PTFE Ferrules	Use for connecting tubes in series.	10-pk.	24073
Diffusion Caps	Required for diffusive sampling with stainless steel tubes.	10-pk.	24074

method applications

Method	Application
U.S. EPA	TO-17
ASTM	D6196
NIOSH	2549
DIN EN ISO	16017

Specifications

Dimensions: 1/4" OD x 3 1/2" long
Low sampling rates: 0.01-0.20 L/min (<10 L total volume)
Long-term storage caps are supplied with conditioned tubes


24061


24062


24067


24054


24055


24071


24070


24074


22114


22115


22116


22117

Polyurethane Foam (PUF) Cartridges

- Use for collection of semivolatiles (pesticides, PCBs, PAHs).
- Both large high-volume (220-280 L/min) and small low-volume (1-5 L/min) PUFs available.
- Suitable for ambient, indoor, and industrial hygiene applications.
- PUF/XAD-2 "sandwiches" capture a wider range of semivolatiles.

method applications

Method	Applications	cat.#
EPA TO-10A	Organochlorine and organophosphorous pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
EPA IP-7	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA IP-8	Organochlorine and organophosphorous pesticides, carbamate, pyrethrin, triazine, and urea pesticides	22116
ASTM D4861	Organochlorine and organophosphorous pesticides, PCB	22116
ASTM D4947	Chlordane and heptachlor residues	22116
Research	Pesticides	22117
EPA TO-4A	Organochlorine pesticides, PCBs	22114
EPA TO-9A	Polychlorinated dibenzo-p-dioxins (PCDDs)	22114
EPA TO-13A	Polycyclic aromatic hydrocarbons (PAHs)	22114
EPA 600/8-80-038	Organochlorine pesticides, PCBs, PAHs	22115
ASTM D6209	Polycyclic aromatic hydrocarbons (PAHs)	22114

Cleaned Polyurethane Foam (PUF) Cartridges

Precleaned and ready to use.

Description	qty.	cat.#
Cleaned PUF Plug (7.6 cm length, 6 cm diameter)	ea.	24295
Large PUF Cartridge, 65 mm OD x 125 mm length, 75 mm PUF	ea.	22114
Large PUF/XAD Cartridge, 65 mm OD x 125 mm length, 25 mm PUF/10 g XAD-2/50 mm PUF	ea.	22115
Small PUF Cartridge, 22 mm OD x 100 mm length, 76 mm PUF	ea.	22116
Small PUF/XAD Cartridge, 22 mm OD x 100 mm length, 30 mm PUF/1.5 g XAD-2/30 mm PUF	ea.	22117


22954


22955


22957

NEW!


22956

Raw Polyurethane Foam (PUF) Plugs

- Unwashed PUF plugs for both low-volume and high-volume sampling.
- Flame retardant free—making them easier to clean for trace analysis.
- Compliant with EPA and ASTM methods—0.022 g/cm^3 density.
- Glass holders sold separately.

Description	Size	qty.	cat.#
Large PUF Plug, Unwashed	6 cm OD x 7.6 cm length	10-pk.	22954
Large PUF Plug, Unwashed	6 cm OD x 5.1 cm length	10-pk.	22955
Large PUF Plug, Unwashed	6 cm OD x 2.5 cm length	10-pk.	22956
Small PUF Plug, Unwashed	22 mm OD x 7.6 cm length	10-pk.	22957


22964


22965

NEW!

PUF Glass Holders

Durable and reusable, PUF glass holders reduce waste and are a cost-effective alternative to precleaned packed cartridges.

- Fit either 6 cm or 22 mm OD PUF plug or can be used with bulk SDVB resin.
- Large glass holder fitted with double stainless steel screens for support.
- Small glass holder has stem designed for secure 1/4" ID tubing connection to sampling pump.

Description	Size	qty.	cat.#
Large PUF Glass Holder	fits 6 cm OD PUF Plug (4.9" L x 2.5" OD)	ea.	22964
Small PUF Glass Holder	fits 22 mm OD PUF Plug (4.4" L x 0.9" OD)	ea.	22965

Ultra-Clean Resin Equivalent to XAD-2 Resin—Exclusively from Restek!

- For adsorbing semivolatiles in air.
- Cleaned, GC tested and certified.
- Available in 100 gram quantities.

Frequently Asked Questions

- **Is Restek's Ultra-Clean resin really the same as XAD®-2 resin?**
  Yes. Restek's resin has been manufactured to match the original XAD®-2 specifications of composition, pore size, and surface area. You will experience identical sampling performance for all semivolatile compounds.
- **Does Restek's Ultra-Clean resin need to be baked-out prior to use?**
  No. Restek's resin is precleaned and prebaked. Unlike other resins, Restek's resin is rigorously cleaned and baked prior to being bottled. When we say our Ultra-Clean resin is precleaned, you can count on it!
- **Is Restek's Ultra-Clean resin safe when using an ECD detector?**
  Yes. Restek's cleaning process involves a unique step that removes compounds that may show up on an electron capture detector (ECD).

Although resin is an excellent adsorbent for trapping PAHs, it requires extensive cleanup because many of its impurities are PAH compounds. To enable you to eliminate time-consuming cleanup, we do the cleaning for you! We test each batch by capillary GC/flame ionization detector to ensure cleanliness. However, depending on your application, additional cleaning may be required.

Description	cat.#
Ultra-Clean Resin, 100 grams	24230

Restek's Ultra-Clean resin typically eliminates the hassle of cleaning and testing resin for air sampling.

method applications

Method	Applications
EPA TO-13A	PAHs in Ambient Air
ASTM D6209	PAHs in Ambient Air
EPA Method 23	Dioxins in Stationary Source Emissions
EPA Method 0010	Semivolatiles in Stationary Source Emissions

SDVB Resin

- Styrene/divinylbenzene, equivalent to XAD-2 resin.
- Untreated, packaged in 1 kg plastic containers.
- Spherical, 20 to 60 mesh particles.

Description	qty.	cat.#
SDVB Resin	1 kg	24053

24053

Midget Glass Impingers

Use with a sampling pump to trap air contaminants into liquid collection media, as specified in OSHA and NIOSH industrial hygiene methods. Both dispersion and fritted nozzles are available as bubblers.

Description	Volume	Taper Size	qty.	cat.#
Midget Glass Impinger w/Fritted Tube	30 mL	24/40	kit	23388
Midget Glass Impinger w/Dispersion Tube	30 mL	24/40	kit	23389

23388

23389

Gas Calibration Standards

Environmental Air Monitoring Gas Standards

Our high-quality air monitoring gas calibration standards are provided by Spectra/Linde and Scott/Air Liquide—meeting lab requirements for two separate sources of calibration standards. Mixes are produced gravimetrically using NIST (National Institute of Science and Technology) traceable weights. Each comes with a Certificate of Analysis and unique serial number. All cylinders are disposable and do not require rental or demurrage fees. Recertification of cylinders is available directly with our suppliers. All cylinders are drop-shipped from our suppliers to provide fast delivery and the "freshest" standard possible. Minimum 12-month stability on all cylinders.

TO-14A Internal Standard Mix (3 components)

bromochloromethane
chlorobenzene-d5
1,4-difluorobenzene

1 ppm in nitrogen, 104 liters @ 1,800 psi cat.# 34412 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi cat.# 26352 (ea.)	NEW!
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34412-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi cat.# 34427 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi cat.# 26353 (ea.)	NEW!
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34427-PI (ea.)	

No data pack available.

TO-14A Internal Standard/Tuning Mix (4 components)

bromochloromethane
1-bromo-4-fluorobenzene (4-bromofluorobenzene)
chlorobenzene-d5
1,4-difluorobenzene

1 ppm in nitrogen, 104 liters @ 1,800 psi cat.# 34408 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi cat.# 26354 (ea.)	NEW!
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34408-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi cat.# 34425 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi cat.# 26355 (ea.)	NEW!
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34425-PI (ea.)	

No data pack available.

TO-14A GC-MS Tuning Mix

4-bromofluorobenzene

1 ppm in nitrogen, 104 liters @ 1,800 psi cat.# 34406 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi cat.# 26346 (ea.)	NEW!
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34406-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi cat.# 34424 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi cat.# 26347 (ea.)	NEW!
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34424-PI (ea.)	

No data pack available.

TO-14A Aromatics Mix (14 components)

benzene
chlorobenzene
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
ethyl benzene
styrene
toluene
1,2,4-trichlorobenzene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi cat.# 34404 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi cat.# 26348 (ea.)	NEW!
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34404-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi cat.# 34423 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi cat.# 26349 (ea.)	NEW!
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34423-PI (ea.)	

No data pack available.

TO-14A Chlorinated Hydrocarbon Mix (19 components)

carbon tetrachloride
chloroform
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethylene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethyl chloride
hexachloro-1,3-butadiene
methyl chloride
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethylene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
vinyl chloride

1 ppm in nitrogen, 104 liters @ 1,800 psi cat.# 34402 (ea.)	
1 ppm in nitrogen, 110 liters @ 1,800 psi cat.# 26350 (ea.)	NEW!
1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34402-PI (ea.)	
100 ppb in nitrogen, 104 liters @ 1,800 psi cat.# 34422 (ea.)	
100 ppb in nitrogen, 110 liters @ 1,800 psi cat.# 26351 (ea.)	NEW!
100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder) cat.# 34422-PI (ea.)	

No data pack available.

See pages 424–425 for cylinder and regulator information.

please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

TO-14A CFC/HCFC Mix (4 components)

trichlorofluoromethane (Freon 11)
dichlorodifluoromethane (Freon 12)
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)
1,2-dichlorotetrafluoroethane (Freon 114)

1 ppm in nitrogen, 104 liters @ 1800 psig
cat.# 34410 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34410-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1800 psig
cat.# 34426 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26356 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34426-PI (ea.)

No data pack available.

TO-14A Calibration Mix (39 components)

benzene
bromomethane
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34400 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26340 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34400-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34421 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26341 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34421-PI (ea.)

No data pack available.

2nd Source TO-14A/TO-15 Gas Calibration Standards

- Standards from TWO manufacturers provide second source on one order.
- 12-Month stability in transportable cylinders.
- Drop shipped for fast delivery and maximum shelf life.

A. Spectra (Linde) 104 L Cylinders
B. Scotty (Air Liquide) 110 L Cylinders
C. Scotty (Air Liquide)110 L Cylinders
(Pi-marked Cylinders for EU Regulations)

See page 425 for regulators.

www.restek.com/air

TO-14A 41 Component Mix (41 components)

acrylonitrile
benzene
bromomethane
1,3-butadiene
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34430 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26342 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34430-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34431 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26343 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34431-PI (ea.)

No data pack available.

TO-14A 43 Component Mix (43 components)

acrylonitrile
benzene
bromomethane
1,3-butadiene
carbon tetrachloride
chlorobenzene
chloroform
chloromethane
3-chloropropene
1,2-dibromoethane
m-dichlorobenzene
o-dichlorobenzene
p-dichlorobenzene
dichlorodifluoromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
dichlorotetrafluoroethane
ethyl benzene
ethyl chloride
4-ethyltoluene
hexachloro-1,3-butadiene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethylene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane
1,1,2-trichlorotrifluoroethane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34432 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26344 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34432-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34433 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26345 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34433-PI (ea.)

No data pack available.

Gas Calibration Standards

TO-15 65 Component Mix (65 components)

acetone
acrolein
benzene
benzyl chloride*
bromodichloromethane
bromoform
bromomethane
1,3-butadiene
2-butanone (MEK)
carbon disulfide*
carbon tetrachloride
chlorobenzene
chloroethane
chloroform
chloromethane
cyclohexane
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
1,4-dioxane
ethanol*
ethyl acetate
ethyl benzene
ethylene dibromide (1,2-dibromoethane)
4-ethyltoluene
trichlorofluoromethane (Freon 11)
dichlorodifluoromethane (Freon 12)
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)
1,2-dichlorotetrafluoroethane (Freon 114)
heptane
hexachloro-1,3-butadiene
hexane
2-hexanone (MBK)
4-methyl-2-pentanone (MIBK)
methylene chloride
methyl *tert*-butyl ether (MTBE)
methyl methacrylate
naphthalene
2-propanol
propylene
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
tetrahydrofuran
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl acetate
vinyl chloride
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34436 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26359 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34436-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34437 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26360 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34437-PI (ea.)

*Stability of this compound cannot be guaranteed.
No data pack available.

TO-15 Subset 25 Component Mix (25 components)

acetone
allyl chloride
benzyl chloride*
bromodichloromethane
bromoform
1,3-butadiene
2-butanone (MEK)
carbon disulfide*
cyclohexane
dibromochloromethane
trans-1,2-dichloroethene
1,4-dioxane
ethyl acetate
4-ethyltoluene
heptane
hexane
2-hexanone (MBK)
4-methyl-2-pentanone
methyl *tert*-butyl ether (MTBE)
2-propanol
propylene
tetrahydrofuran
2,2,4-trimethylpentane
vinyl acetate
vinyl bromide

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34434 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26357 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34434-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34435 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26358 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34435-PI (ea.)

*Stability of this compound cannot be guaranteed.
No data pack available.

TO-14A/TO-15/TO-17 Performance Test Standard

cylinder design
Performance Test Standard

Size: 5A disposable (3.2" x 12")
Volume/Pressure: 150 L @ 1,800 psig
CGA 180 outlet fitting
Weight: 2.2 lb

Restek is pleased to offer the Performance Testing/VOC Audit Sample Program in cooperation with Spectra/Linde. This is an ongoing testing program in which laboratories, and/or other users of VOC standards, are able to evaluate their own capabilities, as well as compare their results and accuracy against other laboratories. As a participant in the program, you will receive a disposable cylinder, directly from Spectra/Linde, containing multiple unknown TO-14A/TO-15 components at varying concentrations that are to be identified, quantified, and reported via the Spectra/Linde P-T Audit Program forms. The results will be published and distributed for peer review. To ensure confidentiality, all participating laboratories will be anonymous, and only the individual laboratory will know their own results. To provide statistical analysis, the audit sample will be shipped to all laboratories at the same time, once a year during the fourth quarter.

150 liters @ 1,800 psig
cat.# 34560 (ea.)

No data pack available.

Massachusetts APH Mix (26 components)

benzene
1,3-butadiene
butylcyclohexane
cyclohexane
n-decane
2,3-dimethylheptane
2,3-dimethylpentane
n-dodecane
ethylbenzene
n-heptane
n-hexane
isopentane
isopropylbenzene
p-isopropyltoluene
methyl *tert*-butyl ether
1-methyl-3-ethylbenzene
naphthalene
n-nonane
n-octane
toluene
1,2,3-trimethylbenzene
1,3,5-trimethylbenzene
n-undecane
o-xylene
m/*p*-xylene (combined)

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34540 (ea.)

100 ppb in nitrogen, 110L @ 1,500psi NEW!
cat.# 26366 (ea.)

100 ppb in nitrogen, 110 liters @ 1,500 psig (Pi-marked cylinder)
cat.# 34540-PI (ea.)

No data pack available.

See pages 424–425 for cylinder and regulator information.

Japan Calibration Mix (9 components)

acrylonitrile
benzene
1,3-butadiene
chloroform
1,2-dichloroethane
dichloromethane
tetrachloroethylene
trichloroethylene
vinyl chloride

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34418-PI (ea.)

No data pack available.

Ozone Precursor Mixture/PAMS (57 components)

acetylene
benzene
n-butane
1-butene
cis-2-butene
trans-2-butene
cyclohexane
cyclopentane
n-decane
m-diethylbenzene
p-diethylbenzene
2,2-dimethylbutane
2,3-dimethylbutane
2,3-dimethylpentane
2,4-dimethylpentane
n-dodecane
ethane
ethylbenzene
ethylene
m-ethyltoluene
o-ethyltoluene
p-ethyltoluene
n-heptane
n-hexane
1-hexene
isobutane
isopentane
isoprene
isopropylbenzene
methylcyclohexane
methylcyclopentane
2-methylheptane
3-methylheptane
2-methylhexane
3-methylhexane
2-methylpentane
3-methylpentane
n-nonane
n-octane
n-pentane
1-pentene
cis-2-pentene
trans-2-pentene
propane
n-propylbenzene
propylene
styrene
toluene
1,2,3-trimethylbenzene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
2,2,4-trimethylpentane
2,3,4-trimethylpentane
n-undecane
o-xylene
m/*p*-xylene (combined)

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34420 (ea.)

1 ppm in nitrogen, 30 liters @ 500 psi NEW!
cat.# 26368 (ea.)

1 ppm in nitrogen, 30 liters @ 500 psi (Pi-marked Cylinder)
cat.# 34420-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34429 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26369 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34429-PI (ea.)

No data pack available.

Sulfur 5-Component Mix (5 components)

6-month stability. +/- 10% accuracy.

carbonyl sulfide
dimethyl sulfide
ethyl mercaptan
hydrogen sulfide
methyl mercaptan

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 34561 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26365 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34561-PI (ea.)

BTEX Gas Mix (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34428-PI (ea.)

No data pack available.

Ozone Precursor/PAMS Mix

(57 components at EPA concentrations: ppbC)

acetylene	40	isopropylbenzene	40
benzene	30	methylcyclohexane	30
n-butane	40	methylcyclopentane	25
1-butene	30	2-methylheptane	25
cis-2-butene	35	3-methylheptane	25
trans-2-butene	25	2-methylhexane	25
cyclohexane	40	3-methylhexane	25
cyclopentane	20	2-methylpentane	20
n-decane	30	3-methylpentane	40
m-diethylbenzene	40	*n*-nonane	25
p-diethylbenzene	25	*n*-octane	30
2,2-dimethylbutane	40	*n*-pentane	25
2,3-dimethylbutane	50	1-pentene	25
2,3-dimethylpentane	50	*cis*-2-pentene	35
2,4-dimethylpentane	40	*trans*-2-pentene	25
n-dodecane	40	propane	40
ethane	25	*n*-propylbenzene	30
ethylbenzene	25	propylene	25
ethylene	20	styrene	40
m-ethyltoluene	25	toluene	40
o-ethyltoluene	30	1,2,3-trimethylbenzene	25
p-ethyltoluene	40	1,2,4-trimethylbenzene	40
n-heptane	25	1,3,5-trimethylbenzene	25
n-hexane	30	2,2,4-trimethylpentane	30
1-hexene	60	2,3,4-trimethylpentane	25
isobutane	25	*n*-undecane	30
isopentane	40	*o*-xylene	25
isoprene	40	*m*/*p*-xylene (combined)	40

20-60 ppbC (parts per billion expressed as carbon) in nitrogen, 104 liters @ 1,800 psi
cat.# 34445 (ea.)

20-60 ppbC (parts per billion expressed as carbon) in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26370 (ea.)

20-60 ppbC (parts per billion expressed as carbon) in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34445-PI (ea.)

No data pack available.

BTEX and MTBE Gas Mix (7 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34541 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26363 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34541-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34542 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi NEW!
cat.# 26364 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked Cylinder)
cat.# 34542-PI (ea.)

No data pack available.

please note

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

please note

Gas standards on this page are not available in Pi-marked cylinders for EU countries.

cylinder design

DCG Partnership Cylinders:

Size: 7.6 x 24 cm
CGA-170/110 connection
U.S. DOT Specs: DOT-4B-240ET

Please note: This cylinder is not approved for use in Canada.

also available

See **page 425** for regulators.

Natural Gas and Refinery Gas Standards

- Each available in three varying concentrations.
- Mini-regulator designed specially for these standards.

Natural Gas Standards

Available in three mixes, from lean to rich. Each has an extended list of C6+ components.

	Natural Gas Standard #1 cat.# 34438, ea. % each compound**	Natural Gas Standard #2 cat.# 34439, ea. % each compound**	Natural Gas Standard #3 cat.# 34440, ea. % each compound**
nitrogen	1.000	2.500	5.000
carbon dioxide	0.500	1.000	1.500
methane UHP	94.750	85.250	70.000
ethane UHP	2.000	5.000	9.000
propane	0.750	3.000	6.000
isobutane	0.300	1.000	3.000
n-butane	0.300	1.000	3.000
isopentane	0.150	0.500	1.000
n-pentane	0.150	0.500	1.000
hexanes plus*	0.100	0.250	0.500
Concentration	mole	mole	mole
Volume	13.16 L @ 200 psig	13.16 L @ 200 psig	5.5 L @ 75 psig
Ideal Heating Value (Dry BTU/SCF)	1,048 gross	1,142 gross	1,317 gross

Ideal Heating Value: Dry BTU/SCF @ 14.696 psia & 60 °F.

*Contact Restek or your Restek representative for a complete list of hexanes plus.

**Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

Refinery Gas Standards

Available in three mixes with varying C5 unsaturates or extended C6+ components.

	Refinery Gas Standard #1 cat.# 34441, ea. % each compound**	Refinery Gas Standard #2 cat.# 34442, ea. % each compound**	Refinery Gas Standard #5 cat.# 34443, ea. % each compound**
hydrogen	40.750	12.500	12.500
argon	0.500	1.000	1.000
nitrogen	4.000	37.200	37.200
carbon monoxide	1.000	1.000	1.000
carbon dioxide	3.000	3.000	3.000
methane	8.500	5.000	5.000
ethane	6.000	4.000	4.000
ethylene	2.000	2.000	2.000
acetylene	—	1.000	1.000
propane	7.000	6.000	6.000
propylene	3.000	3.000	3.000
propadiene	0.850	1.000	1.000
cyclopropane	—	0.040	—
isobutane	6.000	5.000	5.000
n-butane	4.000	4.000	4.000
isobutylene	2.000	1.000	1.000
1,3 butadiene	3.000	3.000	3.000
cis-2-butene	2.000	2.000	2.000
trans-2-butene	2.000	3.000	3.000
butene-1	2.000	2.000	2.000
2-methyl-2-butene	—	0.200	0.200
isopentane	1.000	1.000	1.000
n-pentane	1.000	1.000	1.000
cis-2-pentene	—	0.400	0.400
trans-2-pentene	—	0.160	0.200
pentene-1	—	0.400	0.400
n-hexane	0.500	0.100	—
hexanes plus	—	—	0.100
Concentration	mole	mole	mole
Volume	5.2 L @ 70 psig	4.9 L @ 60 psig	4.6 L @ 60 psig

**Precise concentrations are provided on the data sheet included with each cylinder and may vary slightly from those listed here.

Scott/Air Liquide Transportable Pure Gases and Mixtures in 14-, 48-, and 110-Liter Sizes

We offer a wide range of Scott/Air Liquide transportable gases, from pure gases for purging or calibrating to multi-component mixes, which are ideal for peak identification work.

The 14-liter container has a CGA 160 connection for more precise integration with analytical systems. The 48-liter cylinder has a CGA 165 connection and can deliver large volumes of sample. The 110-liter cylinder has a CGA 180 connection.

See pages 424–425 for cylinder and regulator information.

NOTE: Scotty 14 and Scotty 48 cylinders are not approved for use in Canada.

Description	Shelf Life	Scotty 14 (14 Liter) cat.#		Scotty 48 (48 Liter) cat.#		Scotty 110 (110 Liter) cat.#	
Pure Gases							
Air, zero (THC < 1 ppm)	2 yr	34448		34449		34449-PI	
Argon, 99.995%	2 yr	34457		—	—	34457-PI	
Carbon dioxide, 99.80%	2 yr	34451		34452		34452-PI	
Hydrogen, 99.99%	2 yr	34453		—	—	34453-PI	
Methane, 99.00%	2 yr	34454		—	—	34454-PI	
Oxygen, 99.60%	2 yr	34455		—	—	—	—
Two-Component Mixtures							
Benzene in air (1 ppm)	1 yr	—	—	34458		34458-PI	
Benzene in air (100 ppm)	1 yr	—	—	34459		34459-PI	
1,3-Butadiene in nitrogen (10 ppm)	2 yr	34460		34461		34461-PI	
Carbon dioxide in helium (100 ppm)	2 yr	34462		—	—	34462-PI	
Carbon dioxide in nitrogen (100 ppm)	2 yr	34463		34464		34464-PI	
Carbon dioxide in nitrogen (1,000 ppm)	2 yr	34465		34466		34466-PI	
Ethylene in air (8-10 ppm)	2 yr	34467		34468		34468-PI	
Ethylene in helium (100 ppm)	2 yr	34489		—	—	34489-PI	
Hydrogen in helium (100 ppm)	2 yr	34469		—	—	34469-PI	
Hydrogen in nitrogen (1%)	2 yr	34471		34472		34472-PI	
Hydrogen in nitrogen (100 ppm)	2 yr	34473		34474		34474-PI	
Methane in helium (100 ppm)	2 yr	34476		34477		34477-PI	
Methane in nitrogen (100 ppm)	2 yr	34478		—	—	34478-PI	
Methane in nitrogen (1%)	2 yr	34482		34483		34483-PI	
Nitrogen in helium (100 ppm)	2 yr	34479		—	—	34479-PI	
Nitrous oxide in nitrogen (1 ppm)	2 yr	34484		34485		34485-PI	
Oxygen in helium (100 ppm)	2 yr	34480		—	—	34480-PI	
Oxygen in nitrogen (2%)	2 yr	34487		34488		34488-PI	
Oxygen in nitrogen (6%)	2 yr	34491		34492		34492-PI	
1,1,1-Trichloroethane in nitrogen (10 ppm)	2 yr	—	—	34493		34493-PI	
Trichloroethylene in nitrogen (10 ppm)	2 yr	34494		34495		34495-PI	
Vinyl chloride in nitrogen (1 ppm)	2 yr	34496		34497		34497-PI	
Vinyl chloride in nitrogen (10 ppm)	2 yr	34498		34499		34499-PI	
Vinyl chloride in nitrogen (50 ppm)	2 yr	34500		—	—	34500-PI	
Vinyl chloride in nitrogen (100 ppm)	2 yr	34501		—	—	34501-PI	
Vinyl chloride in nitrogen (1,000 ppm)	2 yr	34502		—	—	34502-PI	
Multi-Component Mixtures							
Carbon monoxide, carbon dioxide, hydrogen, and oxygen in nitrogen (0.5% each)	2 yr	34504		34505		34505-PI	
Carbon monoxide, carbon dioxide, hydrogen, and oxygen in nitrogen (1% each)	2 yr	34507		34508		34508-PI	
Carbon monoxide, carbon dioxide, methane, ethane, ethylene, and acetylene in nitrogen (1% each)	1 yr	—	—	34511		34511-PI	
Carbon monoxide, carbon dioxide, nitrogen, and oxygen (5% each), and methane and hydrogen (4% each) in helium	2 yr	34512		—	—	34512-PI*	
Carbon monoxide (7%), carbon dioxide (15%), and oxygen (5%) in nitrogen	2 yr	34514		—	—	34514-PI	
Carbon monoxide (7%), oxygen (4%), carbon dioxide (15%), and methane (4.5%) in nitrogen	2 yr	34515		34516		34516-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (15 ppm each)	2 yr	34518		34519		34519-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (100 ppm each)	2 yr	34521		34522		34522-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in helium (1,000 ppm each)	2 yr	34524		34525		34525-PI	
C1-C6 *n*-Paraffins: methane, ethane, propane, butane, pentane, hexane in nitrogen (100 ppm each)	2 yr	34527		34528		34528-PI	
C2-C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in helium (100 ppm each)	2 yr	34529		34530		34530-PI	
C2-C6 Olefins: ethylene, propylene, 1-butene, 1-pentene, 1-hexene in nitrogen (100 ppm each)	2 yr	34531		34532		34532-PI	
Branched Paraffins: 2,2-dimethylbutane, 2,2-dimethylpropane, isobutane, 2-methylbutane, 2-methylpentane, 3-methylpentane in nitrogen (15 ppm each)	2 yr	34534		—	—	34534-PI	
Methane, ethane, ethylene, acetylene, propane, propylene, *n*-butane, propyne in nitrogen (15 ppm each)	1 yr	—	—	34537		34537-PI	
n-butane, isobutane, *cis*-2-butene, *trans*-2-butene, 1-butene, iso-butylene, 1,3-butadiene, ethyl acetylene in nitrogen (15 ppm each)	1 yr	—	—	34539		34539-PI	

*Cat.# 34512-PI is 30 L at 500 psig (34.5 bar).

Our Pi-marked gas standards from Scott/Air Liquide meet the requirements of the Transportable Pressure Equipment Directive (TPED) implemented in 2001 that regulates the safe transport of pressurized containers used throughout the European community.

All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

High-Pressure Cylinders

DCG Partnership Cylinders:
Size: 7.6 x 24 cm
CGA-170/110 connection
U.S. DOT Specs: DOT-4B-240ET

Please note: This cylinder is not approved for use in Canada.

Recommended regulator:
cat.# 22052

Scotty® (Air Liquide) 110 L (Pi-marked Cylinders for EU Regulations):
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
CGA-180 outlet fitting
Weight: 2.2 lb/1 kg
DOT Specifications: 3AL2216

Recommended regulators:
cat.# 26371, 26372, 21572, or 21572-R100

Spectra (Linde) 104 L:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800 psi
CGA-180 outlet fitting
Weight: 1.5 lb/0.7 kg

Recommended regulators:
cat.# 21572-R100, 26371, or 26372

Scotty® (Air Liquide) 110 L
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
CGA-180 outlet fitting
Weight: 2.2 lb/1 kg
DOT Specifications: 3AL2216

Recommended regulators:
cat.# 26371, 26372, 21572, or 21572-R100

Scotty® (Air Liquide) 14
Contents: 14 liters
Pressure: 240 psig (17 bar)
Outlet Fitting: CGA 160
Weight: 1.5 lb/0.7 kg
Dimensions: 3" diameter x
11" height (7.6 x 28 cm)
DOT Specifications: 4B240

Please note: This cylinder is not approved for use in Canada.

Recommended regulators:
cat.# 22690 or 22691

Scotty® (Air Liquide) 48
Contents: 48 liters
Pressure: 300 psig (21 bar)
Outlet Fitting: CGA 165
Weight: 1.75 lb/0.8 kg
Dimensions: 4" diameter x
16 1/4" height (10.2 x 41 cm)
DOT Specifications: 39 NRC

Please note: This cylinder is not approved for use in Canada.

Recommended regulators:
cat.# 22690 or 22691

24129

Small Cylinder Stand

- Supports and stabilizes disposable gas cylinders.
- Fits cylinders up to 3 3/8" (8 cm) in diameter.
- Adjustable screw secures cylinder in place.

This cylinder stand is designed to support small diameter cylinders, such as 104 L and 110 L disposable cylinders. It is a simple, safe, and economical way to stabilize the position of small cylinders, while keeping them within close proximity. The stand is constructed of heavy-weight painted steel and includes an adjustable screw for safely securing cylinders.

Description	qty.	cat.#
Small Cylinder Stand	ea.	24129

Mini-Regulator for natural gas and refinery gas standards

- 0–300 psig inlet pressure range.
- 0–15 psig outlet pressure range.
- Supplied with 0–15 psig outlet pressure gauge, brass CGA 170 nut and nipple.

Description	qty.	cat.#
Mini-Regulator	ea.	22032


22032

High-Purity VOC Regulators

- Single-stage, stainless steel.
- Two pressure gauges and CGA-180 fitting.
- 3,000 psig maximum inlet pressure.
- Stainless steel diaphragm and Kel-F® seat.
- 1/8-inch tube compression outlet.
- Low internal volume: 3.03 cc.
- Accurate pressure control even at low flow rates.
- Individually tested for leaks and impurities.


21572

Spectra Gas 7621 High-Purity VOC Regulator

Description	qty.	cat.#
0–30 psig outlet pressure gauge	ea.	21572
0–100 psig outlet pressure gauge	ea.	21572-R100

26371

Air Liquide High-Purity VOC Regulators

Description	qty.	cat.#
CGA 180 (0-30 psig)	ea.	26371
CGA 180 (0-100 psig)	ea.	26372

Regulators for use with 14-liter and 48-liter Scott/Air Liquide Transportable Gases

Use the CGA 160 inlet connection with 14-liter Scott/Air Liquide transportable gases.
Use the CGA 165 inlet connection with 48-liter Scott/Air Liquide transportable gases.

Specifications:
Maximum Inlet Pressure: 300 psig
Outlet Pressure Range: 2–10 psig
Maximum Delivery Pressure: 25 psig
Operating Temperature Range: 35 °F to 150 °F (2 °C to 65 °C)
Outlet Connection: 1/4" female NPT

Materials of Construction:
Body: Brass
Diaphragm: Viton®
Seat: Acetal
Seal: Viton®

Description	qty.	cat.#
Regulator, CGA 160 Inlet Connection	ea.	22690
Regulator, CGA 165 Inlet Connection	ea.	22691


22690

also available
Single-Stage and Dual-Stage Ultra-High Purity Gas Regulators
See **pages 279–281.**

Syringe Adaptor Kit for Single-Stage VOC Regulator

Use to withdraw sample from a high-pressure cylinder after pressure reduction through the high-purity VOC single-stage regulator.

Kit contains one nickel-plated brass 1/4" NPT to female luer fitting, which can be used with an A-2 Luer syringe (cat.# 20162 or 20163), and one stainless steel 1/4" NPT x 1/8" compression fitting with septum (can be used with any syringe needle).

Description	qty.	cat.#
Syringe Adaptor Kit	kit	21118


21118

Gas Sampling

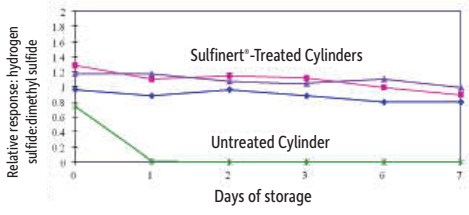
Sample Cylinders

- All cylinders have 1/4" female NPT threads on both ends.
- TPED compliant cylinders available for EU community.

Swagelok® sample cylinders are made of 304 L and 316 L stainless steel to resist corrosion and DOT rated to 1,800 and 5,000 psig (TPED cylinders rated to 1,450 and 4,350 psig), which allows sampling at gas wellheads as well as on-site refineries. Each cylinder is hydrostatically tested to at least 5/3 the working pressure.

Sulfur compounds are stable in Sulfinert®-treated stainless steel systems.

17 ppbv hydrogen sulfide in 500 mL cylinders



Applications:

- ASTM D1265
- Hydrocarbon sampling in refineries & petrochemical plants

Analyzing sulfur or mercury?

- Sulfinert® coating provides stable storage of sulfur and mercury at ppb levels.
- Inert coating doesn't flake; more durable than PTFE.

also available

Certificates are available upon request.

Sample Cylinders, High Pressure (Stainless Steel & Sulfinert® Treated)

- 304L stainless steel; DOT rating to 1,800 psig (TPED cylinders to 1,450 psig).
- Range of cylinder sizes, 75 cc to 2,250 cc.

	1,800 psig, 304L SS		TPED, 1,450 psig, 304L SS	
	Stainless Steel	Sulfinert Treated	Stainless Steel	Sulfinert Treated
Size	cat.#	cat.#	cat.#	cat.#
75 cc	22921	24130	22921-PI	24130-PI
150 cc	22922	24131	22922-PI	24131-PI
300 cc	22923	24132	22923-PI	24132-PI
500 cc	22924	24133	22924-PI	24133-PI
1,000 cc	22925	24134	22925-PI	24134-PI
2,250 cc	22926	21394	22926-PI	21394-PI

Sample Cylinders, Ultra-High Pressure (Stainless Steel & Sulfinert® Treated)

- 316L stainless steel; DOT rating to 5,000 psig (TPED cylinders to 4,350 psig).
- Range of cylinder sizes, 150 cc to 500 cc.

	5,000 psig, 316L SS		TPED, 4,350 psig, 316L SS	
	Stainless Steel	Sulfinert Treated	Stainless Steel	Sulfinert Treated
Size	cat.#	cat.#	cat.#	cat.#
150 cc	22927	22111	22927-PI	22111-PI
300 cc	22928	22112	22928-PI	22112-PI
500 cc	22929	22113	22929-PI	22113-PI

Sample Cylinder Valves (Stainless Steel & Sulfinert® Treated)

- Multiple valve configurations, including dip tube and rupture disks.
- Large, durable, Kel-F® seat ensures leak-free operation.
- Temperature range: -40 °C to 120 °C

Alta-Robbins' unique valve design incorporates a fully contained soft seat that provides durability and longer lifetime. Tight shut-off is easily achieved with very low torque, yet the valve is rugged enough to withstand overtightening.


21400


21401

Multiple valve configurations are available for both high pressure and ultra-high pressure sample cylinders. An outage tube or dip tube provides a headspace above liquefied gases so that, should expansion occur with an increase in temperature, the pressure is not dramatically increased. Outage is expressesd as a percent of the total cylinder volume, based on the ratio of the length of headspace to the total length of the cylinder, with a maximum available outage of 50%. The dip tube is welded directly to the male inlet of the valve and cut to a length of up to 5.25 inches. Rupture discs function to protect sample cylinders from over-pressurization by venting to the atmosphere. The pressure rating on the rupture disc should always be lower than the cylinder.


21402

Description	Stainless Steel cat.#	Sulfinert Treated cat.#
3,500 psig DOT Pressure Rating		
1/4" Male NPT x 1/4" Male NPT	26297	21400
1/4" Male NPT x 1/4" Female NPT	26298	26299
1/4" Male NPT x 1/4" Male Compression	26300	21401
1/4" Male NPT x 1/4" Male NPT w/5.25" Dip Tube*	26301	21402*
1/4" Male NPT x 1/4" Male NPT w/1,800 psi Rupture Disc	26302	26303
1/4" Male NPT x 1/4" Female NPT w/1,800 psi Rupture Disc	26304	26305
Replacement Rupture Disc, 1,800 psig	26320	
5,000 psig DOT Pressure Rating		
1/4" Male NPT x 1/4" Male NPT	26306	26307
1/4" Male NPT x 1/4" Female NPT	26308	26309
1/4" Male NPT x 1/4" Male Compression	26310	26311
1/4" Male NPT x 1/4" Male NPT w/5.25" Dip Tube*	26312	26313
1/4" Male NPT x 1/4" Male NPT w/2,850 psi Rupture Disc	26314	26315
1/4" Male NPT x 1/4" Female NPT w/2,850 psi Rupture Disc	26316	26317
Replacement Rupture Disc, 2,850 psig	26324	


26298


26300


26314

*To order a sample cylinder valve with dip tube, please call Customer Service at 800-356-1688, ext. 3, or contact your Restek representative. Specify dip tube length or % outage when ordering (maximum length = 5.25"/ 13.3 cm). Note: End of part will not be treated after cutting tube to length.

Rupture Disc Tee (Stainless Steel & Sulfinert® Treated)

Unlike other designs, Alta-Robbins rupture disc tee is NOT permanently soldered to the disc, making the discs replaceable. Discs are easily changed without removing the valve or tee from the cylinder. These tees are designed to be installed into existing systems to provide reliable over-pressure protection.


26318


26323

Description	Stainless Steel cat.#	Sulfinert Treated cat.#
1,800 psig DOT Pressure Rating		
Rupture Disc Tee, 1/4" Male NPT x 1/4" Female NPT	26318	26319
Replacement Rupture Disc	26320	
2,850 psig DOT Pressure Rating		
Rupture Disc Tee, 1/4" Male NPT x 1/4" Female NPT	26322	26323
Replacement Rupture Disc	26324	


26324

Metering Control Valves (Stainless Steel & Sulfinert® Treated)

- Reduces pressure between sample cylinder and GC injector.
- Maintains fine metering control.
- Contains Kel-F® seat.

Description	Stainless Steel cat.#	Sulfinert Treated cat.#
3,500 psig DOT Pressure Rating		
Metering Control Valve, 1/4" Male NPT x 1/4" Male NPT	26326	26327


26326

NEW!

Sample Cylinder Accessories

Description	Fittings	qty.	cat.#
Sample Cylinder Carrying Handle, 304 SST for 1.9" & 2" OD Cylinders (Includes handle and two attachment rings)		ea.	26373
Sample Cylinder Carrying Handle, 304 SST for 3.5" & 4" OD Cylinders (Includes handle and two attachment rings)		ea.	26374
Sample Cylinder 316 SST End Pipe Plug, Stainless Steel	1/4" MPT	ea.	26375
Sample Cylinder 316 SST End Pipe Plug, Sulfinert Treated	1/4" MPT	ea.	26376
Sample Cylinder 316 SST Hollow Hex Plug	1/4" MPT	ea.	26377
Sample Cylinder SST Pipe Cap w/Lanyard	1/4" Female NPT & 20" Lanyard	ea.	26378
Sample Cylinder SST Pipe Cap, Stainless Steel	1/4" Female NPT	ea.	22969
Sample Cylinder SST Pipe Cap, Sulfinert Treated	1/4" Female NPT	ea.	22970

Protecting Your Sulfinert®-Treated Products

Cleaning Tips

When cleaning a treated part, rinse with a solvent that will dissolve probable surface contaminants (i.e., use a nonpolar solvent to remove hydrocarbon contaminants, or a more polar solvent to remove more active contaminants).

Avoid using cleaners containing abrasives as they can scratch the layer. Mild sonication may assist in contaminant removal, but do not oversonicate—this could damage the layer. Solids can be removed with a soft nylon bristle brush using light pressure.

Caution! Do not use basic solutions or soaps with pH>8. Do not steam clean Sulfinert®-treated components or lines as this could damage the layer.

Preventing Galling

As with any threaded fitting, galling may occur when assembling two treated parts. To prevent thread damage, use a PTFE tape.

A Scotch-Brite® pad can be used to remove coating from the threads to reduce galling.

Ferrules used in compression fittings should not be coated—leaks may occur.

Troubleshooting

Under normal use, your treated items should deliver outstanding performance for years to come. However, effective lifetime is dependent on the severity of the environment. Factors that can reduce performance are:

- *Contamination*—Failure to properly clean the surface can allow increased surface activity. If performance changes, thoroughly clean the surface and inspect the layer for damage.
- *Erosion*—Contact with abrasives can accelerate surface wear.
- *Bases*—Contact with a base (pH 8 or higher) can accelerate deterioration of the layer.

Surface finish and color should stay consistent throughout the life of the product. Changes in the finish or color may indicate a partial loss of the layer. To prevent further loss, ensure no exposure to bases or abrasives.

Gas Sampling Valves and Sample Loops (Sulfinert® Treated)

- Ideal for samples containing low concentrations of sulfur or other active compounds.
- Sample loop sizes from 5 µL to 5 mL.

Sulfinert® treatment eliminates active sites in the valve or loop for better recovery of active compounds.

20585

Gas Sampling Valves & Replacement Rotors (Sulfinert® Treated)

(1/16" Fittings, 0.40 mm Port Diameter; "W Type" Valve)

Description	qty.	cat.#
Sulfinert Gas Sampling Valve; 4-Port	ea.	20584
Sulfinert Gas Sampling Valve; 6-Port	ea.	20585
Sulfinert Gas Sampling Valve; 10-Port	ea.	20586

Replacement Rotors (Not Coated)

Description	qty.	cat.#
Replacement Rotor (not coated) for 4-Port Sulfinert Gas Sampling Valve	ea.	20587
Replacement Rotor (not coated) for 6-Port Sulfinert Gas Sampling Valve	ea.	20588
Replacement Rotor (not coated) for 10-Port Sulfinert Gas Sampling Valve	ea.	20589

Gas Sample Loops (Sulfinert® Treated) (1/16" fittings, for "W Type" valves)

Description	Size	qty.	cat.#
Sample Loops, Sulfinert Treated	5 µL	ea.	22840
Sample Loops, Sulfinert Treated	10 µL	ea.	22841
Sample Loops, Sulfinert Treated	20 µL	ea.	22842
Sample Loops, Sulfinert Treated	25 µL	ea.	22843
Sample Loops, Sulfinert Treated	50 µL	ea.	22844
Sample Loops, Sulfinert Treated	100 µL	ea.	22845
Sample Loops, Sulfinert Treated	250 µL	ea.	22846
Sample Loops, Sulfinert Treated	500 µL	ea.	22847
Sample Loops, Sulfinert Treated	1 mL	ea.	22848
Sample Loops, Sulfinert Treated	2 mL	ea.	22849
Sample Loops, Sulfinert Treated	5 mL	ea.	22850

Jumbo Syringe

Clear acrylic syringes, ideal for holding and dispensing large volumes of gas. An adjustable plunger on the O-ring ensures that the syringe is gas-tight over a long period of time. The central port is supplied with a luer-lock fitting; the secondary port is supplied with a septum nut. This enables access to the gas sample for adding standards or removing a subsample. The plunger stem is detachable, making sample storage easy.

21276

	SGE			Restek
Volume	Model	cat.#	qty.	cat.#
500 mL	500MAR-LL-GT	009910	ea.	21275
1,000 mL	1000MAR-LL-GT	009920	ea.	21276
2,000 mL	2000MAR-LL-GT	009930	ea.	21277

Syringe O-Rings

21279

21278

Syringe Volume	SGE cat.#	qty.	Restek cat.#
500 mL	032527	ea.	21278
1,000 mL	032532	ea.	21279

Reference Standards

Index of Reference Standards by Industry

Index of Reference Standards by Method Source

American Oil Chemists Society (AOCS) Methods

Association of Analytical Communities (AOAC) International Methods

American Society for Testing & Materials (ASTM) Methods

600 SERIES METHODS – U.S. EPA CLEAN WATER ACT (CWA)

8000 SERIES METHODS – RESOURCE CONSERVATION & RECOVERY ACT (RCRA) SOLID WASTE MANUAL (SW-846)

CLP METHODS – CERCLA/SUPERFUND PROGRAM

STATIONARY SOURCE & AMBIENT AIR METHODS

LOW SULFUR STANDARDS (TITLE 40, CHAPTER 1, PART 80)

LEAKING UNDERGROUND STORAGE TANK (LUST) RECOVERY ACT PROGRAM METHODS

U.S. Pharmacopeia (USP)

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

World-Class Certified

10 CRITICAL STEPS

Whether it's a stock, off-the-shelf reference standard or a one-of-a-kind, custom-formulated solution, there are 10 critical steps that Restek takes to separate our certified reference materials (CRMs) from the competition. For every CRM produced in Restek's ISO-accredited labs, we always:

1 Review Customer & Method Requirements

To determine which organic reference standards we should develop as stock products, Restek experts closely monitor government regulations and methods from around the globe and also actively engage with our customers and distributors. Once a product is chosen based on regulatory changes, customer needs, and our 20+ years of experience, a veteran Restek chemist formulates a stable standard containing an ideal mix of compounds and concentrations. All formulations are then subjected to a thorough review of accuracy, compatibility, and solubility by a second chemist.

2 Verify Compatibility & Stability

All raw materials used in our reference standards are held to strict purity criteria, and compound compatibility is scrutinized during both formulation and review. We also conduct on-going, long-term stability and short-term shipping stability studies in accordance with ISO Guide 34 and ISO Guide 35 to ensure reliability and accurate shelf-life reporting.

3 Characterize Raw Materials Thoroughly

Restek's Quality Control (QC) lab confirms the chemical identity and purity of mixture components and solvents using one or more of the following techniques: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point.

4 Calibrate Analytical Balances

All analytical balances are verified at seven mass levels daily using NIST* traceable weights and are also calibrated yearly by an ISO/IEC 17025:2005–accredited provider to guarantee accurate measurement.

5 Deactivate Glassware & Ampuls

Restek reference standards are prepared using Class A volumetric flasks and/or Class A pipettes. Ampuls and vials used in preparation and packaging are deactivated to prevent the loss of target analytes.

6 Maintain ISO Accreditation

In 2011, the reference standard manufacturing and QC testing laboratories in Restek's state-of-the-art Bellefonte, PA, facility earned ISO Guide 34 and ISO/IEC 17025 accreditation. These accreditations—in addition to ISO 9001 registration, which we have maintained since 1994—serve as recognition that Restek and our labs meet the world-class quality standards established by the International Organization for Standardization (ISO). On-site manufacturing as well as raw material, qualitative, and quantitative analyses are completed in these ISO-accredited labs. *Restek's ISO-accredited labs offer a full line of both stock and custom CRMs.*

* National Institute of Standards and Technology

What are Certified Reference Materials (CRMs)?

A CRM is a reference standard that meets the following set of strict criteria defined under ISO Guide 34 and ISO/IEC 17025:

- All raw materials in the standard must be characterized via qualified methods on qualified instruments.
- The reference standard must be produced in an ISO-accredited lab under documented procedures.
- The reference standard must fall under at least one of the chemical classes for which the lab has been approved under its scope of accreditation.

To learn more about Restek's ISO quality credentials and to view our certificates (including scopes of accreditation), visit **www.restek.com/iso**

Reference Materials (CRMs)

7 Offer a Variety of Documentation

Our fully compliant certified reference materials (CRMs) are available with three levels of documentation:

Gravimetric: Product supplied with the gravimetric records detailing exact amount of each raw material used, purity of each material used, total volume prepared, calculated concentration, and a unique lot number.

Qualitative: A single sample withdrawn from the packaged units is tested by the appropriate technique to verify mixture composition. Product supplied with a certificate of composition showing a chromatogram of the standard with each peak identified, raw material purity, and gravimetric concentration.

Quantitative: A sample of the packaged unit is analyzed in triplicate and the peak areas are statistically compared to a previous lot (if available) or a second independently prepared lot. Unless otherwise specified, the acceptance criteria are as follows: The coefficient of variation (CV) will not exceed 5% for the peak areas of the triplicate injections of the sample. The percent difference of the average peak areas of the sample compared to the previous or second lot will not exceed 10% (13% for gases). A detailed data pack is available at www.restek.com containing gravimetric documentation, all quantitative assay raw data, and statistics. All raw material purity and identification results are available upon request.

Your documentation is also available at **www.restek.com/datapacks**

8 Package Securely & Label Clearly

Every Restek CRM is placed in durable, high-quality packaging for dock-to-door protection. Labeling provides critical storage, safety, and shelf life information in an easy-to-read format.

9 Protect Product Quality After Opening

To help preserve the integrity of our CRMs after they are opened, we include a deactivated screw-top vial with each reference standard for worry-free transfer and reliable temporary storage.

10 Manage Warehouse Inventory

To ensure the inventory is available when it's needed, Restek continually analyzes and maintains inventory of more than 1,100 catalog standards as well as multiple lots of the most commonly requested calibration standards. We pull inventory months before its expiration date to eliminate inadvertent delivery of expired or nearly expired reference standards.

www.restek.com/**reference-standards**

Need a Custom CRM?

Our ISO-Accredited Labs Can Supply Them!

In addition to an extensive selection of reference standards that is in-stock and ready to ship, Restek's custom-formulated solutions also fall under our ISO Guide 34 and ISO/IEC 17025 accreditations. Satisfy all of your certified reference material needs—as well as order GC and LC columns, sample prep supplies, and accessories—using one reliable supplier.

Request a quote for your custom reference standards today! Visit **www.restek.com/solutions**

Save Up to 75% on Custom CRMs!

Establish a Blanket / Standing Order Today

- Significant cost savings.
- Fewer purchase orders and invoices.
- Less instrument downtime.
- Reduced inventory management.
- Flexibility to adjust to changing needs.

Contact Customer Service or your local Restek representative to learn more and start saving!

www.restek.com/contact-us

Reference Standards

Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
acenaphthene	83-32-9	M	1,000	31267
acenaphthylene	208-96-8	M	1,000	31268
acetaldehyde-2,4-DNPH	1019-57-4	ACN	100	33074
acetochlor	34256-82-1	M	100	33208
acetochlor ESA sodium salt	187022-11-3	M	100	33092
acetochlor OA	184992-44-4	M	100	33094
acetone	67-64-1	Neat		30012
acetone	67-64-1	PTM	5,000	30245
acetonitrile	75-05-8	DMSO	2.05 mg/mL	36281
acetonitrile	75-05-8	PTM	1,000	30495
acetophenone	98-86-2	PTM	5,000	30621
acifluorfen	50594-66-6	M	1,000	32255
acifluorfen methyl ester	50594-67-7	M	1,000	32256
acrolein	107-02-8	PTM	5,000	30645
acrolein	107-02-8	W	5,000	30646
acrylamide	79-06-1	M	1,000	30494
acrylonitrile	107-13-1	PTM	2,000	30246
alachlor	15972-60-8	M	1,000	32204
alachlor	15972-60-8	M	100	33207
alachlor ESA sodium salt	142363-53-9	M	100	33096
alachlor OA	171262-17-2	M	100	33099
aldrin	309-00-2	M	1,000	32205
allyl chloride	107-05-1	PTM	2,000	30248
alprazolam	28981-97-7	PTM	1,000	34042
2-amino-4,6-dinitrotoluene	35572-78-2	ACN	1,000	31670
4-amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
aminomethyl phosphonic acid (AMPA)	1066-51-9	W	100	32428
ammelide	645-93-2	DEA:W (20:80)	1,000	33249
ammeline	645-92-1	DEA:W (20:80)	1,000	33250
ammonium picrate**	131-74-8	ACN	2,000	31890
amobarbital	64-43-7	PTM	1,000	34028
d-amphetamine	51-63-8	PTM	1,000	34020
tert-amyl alcohol	75-85-4	PTM	10,000	30631
tert-amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617
tert-amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
5-α-androstane	438-22-2	D	2,000	31065
aniline	62-53-3	M	1,000	31470
anthracene	120-12-7	A	1,000	31269
anthracene-d10	1719-06-08	D	2,000	31037
anthracene (5 mL)	120-12-7	ACN	100	33264
antifoam agent for purge-and-trap	N/A	Neat	1 mL	31822
aprobarbital	77-02-1	PTM	1,000	34029
Aramite	140-57-8	H	2,000	31624
Aroclor 1016	12674-11-2	H	1,000	32006
Aroclor 1016	12674-11-2	I	200	32064

Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1016	12674-11-2	TO	50 mg/kg	32075
Aroclor 1221	11104-28-2	H	1,000	32007
Aroclor 1221	11104-28-2	I	200	32065
Aroclor 1221	11104-28-2	TO	500 mg/kg	32078
Aroclor 1221	11104-28-2	TO	50 mg/kg	32077
Aroclor 1232	11141-16-5	H	1,000	32008
Aroclor 1232	11141-16-5	I	200	32066
Aroclor 1232	11141-16-5	TO	500 mg/kg	32080
Aroclor 1232	11141-16-5	TO	50 mg/kg	32079
Aroclor 1242	53469-21-9	H	1,000	32009
Aroclor 1242	53469-21-9	I	200	32067
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1248	12672-29-6	H	1,000	32010
Aroclor 1248	12672-29-6	I	200	32068
Aroclor 1248	12672-29-6	TO	500 mg/kg	32084
Aroclor 1248	12672-29-6	TO	50 mg/kg	32083
Aroclor 1254	11097-69-1	H	1,000	32011
Aroclor 1254	11097-69-1	I	200	32069
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1260	11096-82-5	H	1,000	32012
Aroclor 1260	11096-82-5	I	200	32070
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1262	37324-23-5	H	1,000	32409
Aroclor 1268	11100-14-4	H	1,000	32410
atrazine	1912-24-9	A	1,000	32208
aviation gas (5 mL)	8006-69-1	PTM	50,000	30208
aviation gas	8006-69-1	PTM	2,500	30094
aviation gas	8006-69-1	PTM	50,000	30207
azobenzene	103-33-3	D	1,000	31496
barbital	57-44-3	PTM	1,000	34030
bentazon	25057-89-0	M	1,000	32257
benzaldehyde	100-52-7	D	2,000	33017
benzene	71-43-2	DMSO	10 mg/mL	36282
benzene	71-43-2	D	250	35262
benzene	71-43-2	PTM	2,000	30249
benzene-d6	1076-43-3	PTM	2,000	30025

*Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

**Meets all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; item may not be resold for export.

Compound	CAS #	Solvent	Conc.	cat.#
benzidine	92-87-5	M	1,000	31441
benzo(a)anthracene	56-55-3	M	1,000	31270
benzo(a)pyrene	50-32-8	A	1,000	31271
benzo(b)fluoranthene	205-99-2	A	1,000	31272
benzo(ghi)perylene	191-24-2	D	1,000	31273
benzo(k)fluoranthene	207-08-9	A	1,000	31274
benzoguanamine	91-76-9	pyridine	1,000	33251
benzoguanamine (5 mL)	91-76-9	pyridine	1,000	33252
benzoic acid	65-85-0	D	2,000	31879
benzoic acid	65-85-0	M	1,000	31415
benzoylecgonine	519-09-5	PTM	1,000	34016
benzphetamine	5411-22-3	PTM	1,000	34022
benzyl benzoate	120-51-4	H	5,000	31847
α-BHC	319-84-6	M	1,000	32206
β-BHC	319-85-7	A	1,000	32209
δ-BHC	319-86-8	M	1,000	32217
γ-BHC (lindane)	58-89-9	M	1,000	32226
bis(2-ethylhexyl)adipate	103-23-1	M	1,000	31449
bis(2-ethylhexyl)phthalate	117-81-7	D	1,000	31420
bromazepam	1812-30-2	PTM	1,000	34043
bromobenzene	108-86-1	PTM	2,000	30250
2-bromobutanoic acid	80-58-0	MTBE	2,000	31881
2-bromobutyrate	3196-15-4	MTBE	2,000	31882
2-bromochlorobenzene	694-80-4	PTM	2,000	30228
4-bromochlorobenzene	106-39-8	PTM	2,000	30230
1-bromo-2-chloroethane	107-04-0	PTM	2,000	30469
bromochloromethane	74-97-5	PTM	2,000	30225
2-bromo-1-chloropropane	3017-95-6	PTM	2,000	30226
bromodichloromethane	75-27-4	PTM	2,000	30251
4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC)	3766-81-2	M	100	32274
1-bromo-4-fluorobenzene	460-00-4	A	1,000	31854
4-bromofluorobenzene	460-00-4	PTM	2,000	30026
4-bromofluorobenzene	460-00-4	PTM	2,500	30067
4-bromofluorobenzene	460-00-4	PTM	5,000	30003
4-bromofluorobenzene	460-00-4	PTM	10,000	30082
bromoform	75-25-2	PTM	2,000	30252
bromomethane	74-83-9	PTM	2,000	30253
1-bromo-2-nitrobenzene	577-19-5	A	1,000	32279
2-bromopropionic acid	598-72-1	MTBE	1,000	31653
butabarbital	125-40-6	PTM	1,000	34031
butachlor ESA sodium salt		M	100	33202
1,3-butadiene	106-99-0	PTM	2,000	30622
butalbital	77-26-9	PTM	1,000	34032
1,4-butanediol	110-63-4	M	1,000	34078
(s)-(-)-1,2,4-butanetriol	42890-76-6	pyridine	1,000	33024
(s)-(-)-1,2,4-butanetriol (5 mL)	42890-76-6	pyridine	1,000	33032
1-butanol	71-36-3	PTM	50,000	30474
tert-butanol	75-65-0	PTM	50,000	30470
tert-butanol-d9	25725-11-5	PTM	20,000	30618
2-butanone (MEK)	78-93-3	PTM	5,000	30254
γ-butyrolactone (GBL)	96-48-0	ACN	1,000	34077

*Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

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Solvent codes:

A = acetone
ACN = acetonitrile
C = carbon disulfide
Cy = cyclohexane
D = methylene chloride
DEA = diethylamine
DMSO = dimethyl sulfoxide
EA = ethyl acetate
H = hexane
I = isooctane
Ip = isopropanol
M = methanol
MTBE = methyl *tert*-butyl ether
PTM = purge-and-trap grade methanol
T = toluene
TO = transformer oil
W = water (DI)

Compound	CAS #	Solvent	Conc.	cat.#
caffeine	58-08-2	W	5	31804
caffeine	58-08-2	W	25	31803
caffeine	58-08-2	W	125	31802
caffeine	58-08-2	W	250	31801
caffeine	58-08-2	W	500	31800
caffeine	58-08-2	M	1,000	34084
cannabichromene	20675-51-8	PTM	1,000	34092
cannabidiol	13956-29-1	PTM	1,000	34011
cannabigerol	25654-31-3	PTM	1,000	34091
cannabinol	521-35-7	PTM	1,000	34010
ε-caprolactam	105-60-2	D	2,000	31833
carbazole	86-74-8	D	1,000	31836
carbazole	86-74-8	M	1,000	31430
carbon disulfide	75-15-0	PTM	2,000	30258
carbon tetrachloride	56-23-5	DMSO	20 mg/mL	36283
carbon tetrachloride	56-23-5	PTM	2,000	30259
chloral hydrate	302-17-0	ACN	1,000	30609
chlordane	57-74-9	H	1,000	32021
chlordane	57-74-9	I	5,000	32072
chlordane	57-74-9	M	2,000	32016
cis-chlordane	5103-71-9	M	1,000	32207
trans-chlordane	5566-34-7	M	1,000	32227
chlordiazepoxide	438-41-5	PTM	1,000	34044
4-chloroaniline	106-47-8	D	2,000	31211
chlorobenzene	108-90-7	DMSO	1.8 mg/mL	36284
chlorobenzene	108-90-7	PTM	2,000	30261
chlorobenzene-d5	3114-55-4	PTM	2,000	30223
chlorobenzilate	510-15-6	M	1,000	32211
chloroethane	75-00-3	PTM	2,000	30263
2-chloroethanol	107-07-3	PTM	2,000	30264
2-chloroethyl vinyl ether	110-75-8	PTM	2,000	30265
1-chloro-2-fluorobenzene	348-51-6	PTM	2,000	30040
1-chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066
chloroform	67-66-3	DMSO	0.3 mg/mL	36285
chloroform	67-66-3	PTM	2,000	30266
chloromethane	74-87-3	PTM	2,000	30267
2-chloronaphthalene	91-58-7	M	1,000	31284
4-chloro-3-nitrobenzotrifluoride	121-17-5	A	1,000	32282
1-chlorooctadecane	3386-33-2	D	10,000	31098
1-chlorooctane	111-85-3	PTM	10,000	30084
chloroprene	126-99-8	PTM	5,000	30238
chlorpyrifos	2921-88-2	M	1,000	32212
chrysene	218-01-9	A	1,000	31275
clobazam	22316-47-8	PTM	1,000	34045
clonazepam	1622-61-3	PTM	1,000	34046
cocaethylene	529-38-4	ACN	1,000	34066
cocaine	53-21-4	PTM	1,000	34015
codeine	76-57-3	PTM	1,000	34000
continine	486-56-6	M	1,000	34086
creosote oil	8001-58-9	D	50,000	31838
cyanazine	21725-46-2	A	1,000	32215
cyanuric acid	108-80-5	DEA:W (20:80)	1,000	33248
cyclohexane	110-82-7	DMSO	19.4 mg/mL	36286
2,4-D (2,4-dichlorophenoxyacetic acid)	94-75-7	M	1,000	32239
2,4-D methyl ester	1928-38-7	M	1,000	32240
Dacthal (DCPA dimethyl ester)	1861-32-1	M	1,000	32216
dalapon	75-99-0	ACN	1,000	32432
dalapon	75-99-0	M	1,000	32253
dalapon	75-99-0	M	2,000	32056
dalapon methyl ester	17640-02-7	H	2,000	32057
dalapon methyl ester	17640-02-7	M	1,000	32254
2,4-DB	94-82-6	M	1,000	32241
DCPA diacid	2136-79-0	M	200	32261
2,4'-DDD	53-19-0	M	1,000	32098
4,4'-DDD	72-54-8	M	1,000	32201
2,4'-DDE	3424-82-6	M	1,000	32099
4,4'-DDE	72-55-9	M	1,000	32202
2,4'-DDT	789-02-6	M	1,000	32200
4,4'-DDT	50-29-3	M	1,000	32203

Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
decachlorobiphenyl (BZ #209) (5 mL)	2051-24-3	A	200	32030
decachlorobiphenyl (BZ #209)	2051-24-3	A	200	32029
decachlorobiphenyl (BZ #209)	2051-24-3	I	10	32289
decafluorobiphenyl	434-90-2	A	1,000	31855
decafluorobiphenyl	434-90-2	D	2,000	31041
decafluorobiphenyl	434-90-2	ACN	1,000	31842
decafluorotriphenylphosphine (DFTPP)	5074-71-5	D	2,500	31001
n-decane	124-18-5	Neat	1 mL	31858
desethyl-atrazine	6190-65-4	A	1,000	32445
desisopropylatrazine	1007-28-9	A	1,000	32446
dextromethorphan HBr monohydrate	125-69-9	M	1,000	34081
dextro-propoxyphene	1639-60-7	PTM	1,000	34008
diazepam	439-14-5	PTM	1,000	34047
dibenzo(a,h)anthracene	53-70-3	D	1,000	31276
4,4' -dibromobiphenyl	92-86-4	D	2,000	31039
4,4' -dibromobiphenyl	92-86-4	EA	500	32092
dibromochloromethane (chlorodibromochloromethane)	124-48-1	PTM	2,000	30271
1,2-dibromo-3-chloropropane (DBCP)	96-12-8	PTM	2,000	30270
1,2-dibromoethane	106-93-4	PTM	2,000	30272
dibromofluoromethane	1868-53-7	Neat	100 mg	30634
dibromomethane	74-95-3	PTM	2,000	30430
4,4' -dibromooctafluorobiphenyl	10386-84-2	D	2,000	31040
4,4' -dibromooctafluorobiphenyl	10386-84-2	H	250	32053
4,4' -dibromooctafluorobiphenyl	10386-84-2	MTBE	2,000	31856
2,3-dibromopropionic acid	600-05-5	MTBE	1,000	31655
2,5-dibromotoluene	615-59-8	PTM	1,000	30435
2,5-dibromotoluene	615-59-8	PTM	10,000	30453
dibutylchlorendate	1770-80-5	A	200	32025
dicamba	1918-00-9	M	1,000	32247
dicamba methyl ester	6597-78-0	M	1,000	32248
1,2-dichlorobenzene	95-50-1	M	1,000	31442
1,3-dichlorobenzene	541-73-1	M	1,000	31443
1,4-dichlorobenzene	106-46-7	ACN	1,000	30498
1,4-dichlorobenzene	106-46-7	M	1,000	31444
1,2-dichlorobenzene-d4	2199-69-1	PTM	2,000	30049
3,3' -dichlorobenzidine	91-94-1	D	2,000	31835
3,3' -dichlorobenzidine	91-94-1	M	2,000	31026
3,5-dichlorobenzoic acid	51-36-5	MTBE	1,000	31652
3,5-dichlorobenzoic acid methyl ester	2905-67-1	M	1,000	32264
3,5-dichlorobenzoic acid methyl ester	2905-67-1	MTBE	1,000	31649
1,4-dichlorobutane	110-56-5	PTM	2,000	30227
trans-1,4-dichloro-2-butene	110-57-6	PTM	2,000	30274
dichlorodifluoromethane (CFC-12)	75-71-8	PTM	2,000	30275
1,1-dichloroethane	75-34-3	PTM	2,000	30276
1,2-dichloroethane	107-06-2	DMSO	25 mg/mL	36288
1,2-dichloroethane	107-06-2	PTM	2,000	30277
1,2-dichloroethane-d4	17060-07-0	PTM	2,000	30027
1,1-dichloroethene	75-35-4	DMSO	40 mg/mL	36287
1,1-dichloroethene	75-35-4	PTM	2,000	30278
cis-1,2-dichloroethene	156-59-2	PTM	2,000	30279
trans-1,2-dichloroethene	156-60-5	PTM	2,000	30280
cis-1,2-dichloroethylene	156-59-2	DMSO	4.67 mg/mL	36289
trans-1,2-dichloroethylene	156-60-5	DMSO	4.67 mg/mL	36290
2,6-dichlorophenol	87-65-0	M	1,000	31409
2,4-dichlorophenylacetic acid	19719-28-9	M	200	32049
2,4-dichlorophenylacetic acid	19719-28-9	A	1,000	32439
2,4-dichlorophenyl acetic acid methyl ester	55954-23-9	H	200	32050
1,2-dichloropropane	78-87-5	PTM	2,000	30281
2,2-dichloropropane	594-20-7	PTM	2,000	30283
cis-1,3-dichloropropene	10061-01-5	PTM	2,000	30284
trans-1,3-dichloropropene	10061-02-6	PTM	2,000	30285
2,3-dichloropropionic acid	565-64-0	MTBE	1,000	31650
2,3-dichloropropionic acid methyl ester	3674-09-7	MTBE	1,000	31651
1,2-dichlorotetrafluoroethane (CFC-114)	76-14-2	PTM	2,000	30476
dichlorprop	120-36-5	M	1,000	32249
dichlorprop methyl ester	57153-17-0	M	1,000	32250
dieldrin	60-57-1	M	1,000	32218
diesel fuel #2 composite (5 mL)	68334-30-5	D	50,000	31259
diesel fuel #2 composite	68334-30-5	D	5,000	31093
diesel fuel #2 composite	68334-30-5	D	50,000	31258
diesel fuel #2: 25% weathered	68334-30-5	D	5,000	31234
diesel fuel #2: 50% weathered	68334-30-5	D	5,000	31235
diesel fuel #2: 75% weathered	68334-30-5	D	5,000	31236
diesel fuel #2: unweathered	68334-30-5	D	5,000	31233
diesel:biodiesel (80:20)	67784-80-9	D	5,000	31880
diethyl ether (ethyl ether)	60-29-7	PTM	2,000	30286
1,4-difluorobenzene	540-36-3	PTM	2,000	30032
diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
dimethachlor ESA sodium salt		M	100	33203
1,2-dimethoxyethane	173201-80-4	DMSO	0.5 mg/mL	36291
N,N-dimethylacetamide	127-19-5	DMSO	5.45 mg/mL	36292
dimethyldichlorosilane (DMDCS) (20 mL)	75-78-5	Neat	20 mL	31840
N,N-dimethylformamide	68-12-2	DMSO	4.4 mg/mL	36293
3,5-dinitroaniline	618-87-1	ACN	1,000	31661
1,2-dinitrobenzene	528-29-0	M	1,000	31453
1,3-dinitrobenzene	99-65-0	ACN	1,000	31662
1,4-dinitrobenzene	100-25-4	ACN	2,000	33205
2,4-dinitrophenol	51-28-5	M	1,000	31291
2,4-dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-dinitrotoluene	610-39-9	EA	2,000	33901
3,4-dinitrotoluene	610-39-9	M	1,000	31452
di-*n*-octyl phthalate	117-84-0	M	1,000	31426
dinoseb	88-85-7	M	1,000	32251
dinoseb methyl ether	6099-79-2	M	1,000	32252
diolein (1,3-di[*cis*-octadecenoyl] glycerol)	2465-32-9	pyridine	5,000	33022
1,4-dioxane	123-91-1	DMSO	1.9 mg/mL	36294
1,4-dioxane	123-91-1	D	2,000	31853
1,4-dioxane	123-91-1	PTM	2,000	30287
1,4-dioxane-d8	17647-74-4	PTM	2,000	30614
1,2-diphenylhydrazine	122-66-7	M	1,000	31497
diuron	330-54-1	ACN	200	32450
ecgonine	5796-31-6	PTM	1,000	34017
ecgonine methyl ester	38969-40-3	PTM	1,000	34018
EDDP perchlorate	66729-78-0	M	1,000	34069
EGDN**	628-96-6	M	1,000	31601
endosulfan I	959-98-8	A	1,000	32465
endosulfan II	33213-65-9	A	1,000	32466
endosulfan sulfate	1031-07-8	A	1,000	32467
endrin	72-20-8	A	1,000	32463
endrin ketone	53494-70-5	A	1,000	32464
ethanol	64-17-5	PTM	2,000	30288
ethanol	64-17-5	W	10,000	30466
2-ethoxyethanol	110-80-5	DMSO	0.8 mg/mL	36295
ethylbenzene	100-41-4	DMSO	1.84 mg/mL	36296
ethylbenzene	100-41-4	PTM	2,000	30290
ethylbenzene-d10	25837-05-2	PTM	2,000	30029
ethylbenzene-d5	20302-26-5	PTM	2,000	30028
ethyl-*tert*-butyl ether (ETBE)	637-92-3	PTM	2,000	30628
ethylenediamine	107-15-3	M	540	35222
ethylene glycol	3775-85-7	DMSO	3.1 mg/mL	36297
ethylene oxide	75-21-8	D	50 mg/mL	30620
ethylene oxide	75-21-8	DMSO	500	36005
ethyl methacrylate	97-63-2	PTM	2,000	30289
fentanyl	437-38-7	M	1,000	34082
nor-fentanyl oxalate	1609-66-1	M	1,000	34083

*Volume is 1 mL/ampul unless otherwise noted. Concentration is µg/mL unless otherwise noted.

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Compound	CAS #	Solvent	Conc.	cat.#
flunitrazepam	1622-62-4	PTM	1,000	34049
fluoranthene	206-44-0	M	1,000	31277
fluorene	86-73-7	M	1,000	31278
fluorobenzene	462-06-6	PTM	2,000	30030
2-fluorobiphenyl	321-60-8	D	2,000	31091
2-fluorobiphenyl	321-60-8	D	10,000	31096
1-fluoronaphthalene	321-38-0	D	2,000	31092
2-fluorophenol	367-12-4	D	2,000	31047
flurazepam	1172-18-5	PTM	1,000	34050
formaldehyde-DNPH	1081-15-8	ACN	500	31837
formaldehyde-2,4-DNPH	1081-15-8	ACN	100	33082
formaldehyde oxazoladine		T	2,000	33004
formamide	75-12-7	DMSO	1.1 mg/mL	36298
fuel oil # 4	68476-31-3	D	5,000	31216
fuel oil # 4	68476-31-3	D	50,000	31244
fuel oil # 5	70892-11-4	D	5,000	31217
fuel oil # 5	70892-11-4	D	50,000	31246
fuel oil # 6 (5 mL)	68553-00-4	D	50,000	31249
fuel oil # 6	68553-00-4	D	5,000	31218
fuel oil # 6	68553-00-4	D	50,000	31248
DL-glutethimide	18389-24-7	PTM	1,000	34058
glycerin	56-81-5	pyridine	500	33020
glycolaldehyde-2,4-DNPH		ACN	100	33091
glyphosate (5 mL)	1071-83-6	W	1,000	32427
glyphosate	1071-83-6	W	1,000	32426
1,6-HDIP	72375-27-0	DMSO	1,000	33002
heptachlor	76-44-8	M	1,000	32228
heptachlor epoxide (isomer B)	1024-57-3	M	1,000	32230
2,2' ,3,4,4' ,5,5' -heptachlorobiphenyl (BZ #180)	35065-29-3	I	10	32288
hexachlorobenzene	118-74-1	A	1,000	32231
2,2' ,3,4,4' ,5' -hexachlorobiphenyl (BZ #138)	35065-28-2	I	10	32286
2,2' ,4,4' ,5,5' -hexachlorobiphenyl (BZ #153)	35065-27-1	I	10	32287
hexachloro-1,3-butadiene	87-68-3	M	1,000	31435
hexachlorocyclopentadiene	77-47-4	M	1,000	32232
hexachloroethane	67-72-1	M	1,000	31436
hexachlorophene	70-30-4	D	2,000	31811
hexane	8031-34-3	DMSO	1.45 mg/mL	36299
hexobarbital	56-29-1	PTM	1,000	34033
HMX**	2691-41-0	ACN	1,000	31665
hydraulic oil	64741-89-5	D	50,000	31839
hydrocodone	34195-34-1	PTM	1,000	34002
hydromorphone	71-68-1	PTM	1,000	34063
indeno(1,2,3-cd)pyrene	193-39-5	D	1,000	31279
iodomethane	74-88-4	PTM	2,000	30292
isobutyl alcohol	78-83-1	PTM	2,000	30293
isobutylbenzene		PTM	1,000	30613
isopropylbenzene	98-82-8	PTM	2,000	30294
jet fuel A (5 mL)	64742-47-8	D	50,000	31243
jet fuel A	64742-47-8	D	5,000	31215
jet fuel A	64742-47-8	D	50,000	31242
JP-4 military fuel	8008-20-6	D	5,000	31219
JP-4 military fuel	8008-20-6	D	50,000	31250
JP-4 military fuel	8008-20-6	PTM	50,000	30472
JP-5 military fuel	8008-20-6	D	5,000	31220
JP-5 military fuel	8008-20-6	D	50,000	31252
JP-8 military fuel	8008-20-6	D	5,000	31262
JP-8 military fuel	8008-20-6	D	50,000	31254
kerosene composite (5 mL)	84742-81-0	D	50,000	31257
kerosene composite	84742-81-0	D	5,000	31094
kerosene composite	84742-81-0	D	50,000	31256
kerosene: 25% weathered	84742-81-0	D	5,000	31230
kerosene: 50% weathered	84742-81-0	D	5,000	31231
kerosene: 75% weathered	84742-81-0	D	5,000	31232
kerosene: unweathered	84742-81-0	D	5,000	31229
levorphanol	5985-38-6	PTM	1,000	34003
lorazepam	846-49-1	PTM	1,000	34051

Compound	CAS #	Solvent	Conc.	cat.#
MCPA	94-74-6	M	1,000	32269
MCPP	93-65-2	M	1,000	32271
3,4-MDA HCl	4764-17-4	M	1,000	34070
3,4-MDEA HCl	82801-81-8	M	1,000	34072
4,4' -MDIP	72375-24-7	DMSO	1,000	33003
3,4-MDMA HCl	64057-70-1	M	1,000	34071
melamine	108-78-1	DEA:W (20:80)	1,000	33247
meperidine	50-13-5	PTM	1,000	34004
mephobarbital	115-38-8	PTM	1,000	34034
meprobamate	57-53-4	PTM	1,000	34059
methacrylonitrile	126-98-7	PTM	2,000	30297
methadone	1095-90-5	PTM	1,000	34005
(+)methamphetamine	51-57-0	PTM	1,000	34021
methanol	67-56-1	DMSO	15 mg/mL	36401
methanol	67-56-1	W	10,000	30467
methaqualone	340-56-7	PTM	1,000	34064
methohexital	151-83-7	PTM	1,000	34035
methoxychlor	72-43-5	M	1,000	32233
2-methoxyethanol	109-86-4	DMSO	0.25 mg/mL	36402
1-(methylamino)anthraquinone	82-38-3	D	100	31823
methyl arachidate	1120-28-1	Neat		35056
methyl arachidonate	2566-89-4	Neat		35060
methyl behenate	929-77-1	Neat		35062
methyl *tert*-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402
methylbutylketone	591-78-6	DMSO	0.25 mg/mL	36400
methyl caprate	110-42-9	Neat		35041
methyl caproate	106-70-7	Neat		35037
methyl caprylate	111-11-5	Neat		35039
3-methylcholanthrene	56-49-5	D	2,000	31996
methylcyclohexane	108-87-2	DMSO	5.9 mg/mL	36403
methyl-2,3-dibromopropionate	1729-67-5	MTBE	1,000	31656
2-methyl-4,6-dinitrophenol	534-52-1	M	1,000	31292
methyl eicosadienoate	2463-02-7	Neat		35058
methyl eicosatrienoate	55682-88-7	Neat		35059
methyl eicosenoate	2390-09-2	Neat		35057
methyl erucate	1120-34-9	Neat		35063
methyl heneicosanoate	6064-90-0	Neat		35061
methyl heptadecanoate	1731-92-6	Neat		35050
methyl heptanoate	106-73-0	Neat		35038

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Solvent codes:

A = acetone
ACN = acetonitrile
C = carbon disulfide
Cy = cyclohexane
D = methylene chloride
DEA = diethylamine
DMSO = dimethyl sulfoxide
EA = ethyl acetate
H = hexane
I = isooctane
Ip = isopropanol
M = methanol
MTBE = methyl *tert*-butyl ether
PTM = purge-and-trap grade methanol
T = toluene
TO = transformer oil
W = water (DI)

Single-Component Solutions

Compound	CAS #	Solvent	Conc.	cat.#
methyl laurate	111-82-0	Neat		35043
methyl lignocerate	2442-49-1	Neat		35064
methyl linoleate	112-63-0	Neat		35053
methyl linolenate	301-00-8	Neat		35054
methyl methacrylate	80-62-6	PTM	2,000	30299
methyl myristate	124-10-7	Neat		35045
methyl myristoleate	56219-06-8	Neat		35046
1-methylnaphthalene	90-12-0	M	1,000	31283
2-methylnaphthalene	91-57-6	D	1,000	31285
methyl nervonate	2733-88-2	Neat		35065
2-methyl-4-nitroaniline	99-52-5	M	1,000	31612
methyl nonadecanoate	1731-94-8	Neat		35055
methyl nonanoate	1731-84-6	Neat		35040
methyl oleate	112-62-9	Neat		35052
methyl palmitate	112-39-0	Neat		35048
methyl palmitoleate	1120-25-8	Neat		35049
methyl pentadecanoate	7132-64-1	Neat		35047
4-methyl-2-pentanone (MIBK)	108-10-1	PTM	5,000	30400
3-methylphenol	108-39-4	M	1,000	31403
N-methylpyrrolidone	872-50-4	DMSO	2.65 mg/mL	36405
methyl stearate	112-61-8	Neat		35051
methyl tridecanoate	1731-88-0	Neat		35044
methyl undecanoate	1731-86-8	Neat		35042
α-methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079
methylene chloride (dichloromethane)	75-09-2	DMSO	3 mg/mL	36404
methylene chloride (dichloromethane)	75-09-2	PTM	2,000	30401
methyprylon	125-64-4	PTM	1,000	34060
metolachlor	51218-45-2	M	100	33209
metolachlor ESA sodium salt	171118-09-5	M	100	33200
metolachlor OA	152019-73-3	M	100	33201
metribuzin	21087-64-9	A	1,000	32436
mineral spirits: 25% weathered	8030-30-6	D	5,000	31226
mineral spirits: 50% weathered	8030-30-6	D	5,000	31227
mineral spirits: 75% weathered	8030-30-6	D	5,000	31228
mineral spirits: unweathered (5 mL)	8030-30-6	D	50,000	31261
mineral spirits: unweathered	8030-30-6	D	5,000	31225
mineral spirits: unweathered	8030-30-6	D	50,000	31260
monolein (1-mono[*cis*-9-octadecenoyl]-rac-glycerol)	111-03-5	pyridine	5,000	33021
monopalmitin	524-44-9	pyridine	5,000	33026
morphine	6211-15-0	PTM	1,000	34006
motor oil composite	64742-47-8	D	50,000	31464
naphthalene	91-20-3	M	1,000	31280
naphthalene-d8	1146-65-2	D	2,000	31043
nicarbazin (bis-nitrophenol urea) (5 mL)	330-95-0	ACN	10	33261
nicotine	54-11-5	M	1,000	34085
nitrazepam	146-22-5	PTM	1,000	34053
nitrobenzene	98-95-3	ACN	1,000	31657
nitrobenzene-d5	4165-60-0	D	2,000	31044
nitroglycerin**	55-63-0	M	1,000	31498
nitroguanidine**	556-88-7	M	1,000	31602
2-nitromesitylene	603-71-4	M	2,000	33902
nitromethane	75-52-5	DMSO	0.25 mg/mL	36406
4-nitrophenol	100-02-7	M	1,000	31296
2-nitropropane	79-46-9	PTM	2,000	30403
N-nitrosodimethylamine	62-75-9	M	1,000	31427
N-nitrosodimethylamine-d6	17829-05-9	D	1,000	33910
N-nitrosodiphenylamine	86-30-6	M	1,000	31429
N-nitroso-di-*n*-propylamine	621-64-7	M	1,000	31428
N-nitrosodi-*n*-propylamine-d14	93951-96-3	D	1,000	33911
2-nitrotoluene	88-72-2	ACN	1,000	31659
3-nitrotoluene	99-08-1	ACN	1,000	31660
4-nitrotoluene	99-99-0	ACN	1,000	31658
n-nonatriacontane (C39) (10 mL)	7194-86-7	C	3,000	31877
n-nonatriacontane (C39)	7194-86-7	C	3,000	31456
n-octacosane (C28)	630-02-4	D	10,000	31672
oxazepam	604-75-1	PTM	1,000	34054
oxycodone	124-90-3	PTM	1,000	34007
oxymorphone	76-41-5	PTM	1,000	34065
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263
pentachloroanisole	1825-21-4	M	1,000	32268
2,2' ,4,5,5' -pentachlorobiphenyl (BZ #101)	37680-73-2	I	10	32285
2,3' ,4,4' ,5-pentachlorobiphenyl (BZ #118)	31508-00-6	I	10	32293
pentachloroethane	76-01-7	PTM	2,000	30404
pentachloronitrobenzene	82-68-8	EA	100	32091
pentachlorophenol	87-86-5	M	1,000	31297
n-pentacontane (C50)	6596-40-3	T	10	31685
pentacosane (C25)	629-99-2	D	10,000	31487
pentafluorobenzene	363-72-4	PTM	2,000	30031
pentafluorophenol	771-61-9	D	2,000	31048
pentazocine	64024-15-3	PTM	1,000	34062
pentobarbital	76-74-4	PTM	1,000	34036
perfluorotributylamine (PFTBA)	311-89-7	Neat	1 mL	30482
perfluorotributylamine (PFTBA)	311-89-7	Neat	1 g	33027
PETN (pentaerythritol tetranitrate)**	78-11-5	M	1,000	31600
phenanthrene	85-01-8	M	1,000	31281
phenanthrene-d10	1517-22-2	D	2,000	31045
phencyclidine	956-90-1	PTM	1,000	34027
phendimetrazine	50-58-8	PTM	1,000	34025
phenmetrazine	1707-14-8	PTM	1,000	34026
phenobarbital	50-06-6	PTM	1,000	34037
phenol	108-95-2	M	1,000	31298
phenol-d6	13127-88-3	D	2,000	31049
phentermine	1197-21-3	PTM	1,000	34024
phenylpropanolamine HCl	154-41-6	M	1,000	34073
picloram	1918-02-1	M	1,000	32265
picloram methyl ester	14143-55-6	M	1,000	32266
picric acid**	88-89-1	M	1,000	31499
Polywax 500	9002-88-4	Neat	1 g	36224
Polywax 655	9002-88-4	Neat	1 g	36225
Polywax 850	9002-88-4	Neat	1 g	36226
Polywax 1000	9002-88-4	Neat	1 g	36227
prazepam	2955-38-6	PTM	1,000	34055
prometryne	7287-19-6	A	1,000	32449
propachlor	1918-16-7	M	1,000	32235
2-propanol	67-63-0	W	50,000	30473
propazine	139-40-2	A	1,000	32448
propionitrile	107-12-0	PTM	2,000	30407
propylene glycol dinitrate (PGDN)	6423-43-4	M	1,000	31821
pyrene	129-00-0	M	1,000	31282
pyridine	110-86-1	DMSO	1 mg/mL	36407
pyridine	110-86-1	PTM	2,000	30409
pyridine-d5	7291-22-7	D	2,000	31046

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Compound	CAS #	Solvent	Conc.	cat.#
RDX**	121-82-4	ACN	1,000	31666
secobarbital	29071-21-4	PTM	1,000	34038
simazine	122-34-9	A	1,000	32236
stearyl stearate (10 mL)	2778-96-3	Cy	2,000	31636
stearyl stearate (10 mL)	2778-96-3	H	2,000	31681
stearyl stearate	2778-96-3	Neat	100 mg	31860
Stoddard solvent	8052-41-3	PTM	10,000	30487
styrene	100-42-5	PTM	2,000	30410
sulfolane	126-33-0	DMSO	0.8 mg/mL	36413
2,4,5-T	93-76-5	M	200	32243
2,4,5-T methyl ester	1928-37-6	M	1,000	32244
talbutal	115-44-6	PTM	1,000	34039
2,4-TDIP	72375-21-4	DMSO	1,000	33001
2,6-TDIP	195625-39-9	DMSO	1,000	33000
temazepam	896-50-4	PTM	1,000	34056
terbuthylazine	5915-41-3	A	1,000	32447
o-terphenyl	84-15-1	A	2,000	31066
o-terphenyl	84-15-1	D	10,000	31097
p-terphenyl	92-94-4	D	10,000	31095
p-terphenyl-d14	1718-51-0	D	1,000	31828
α-terpineol	98-55-5	D	2,000	33912
2,2' ,5,5' -tetrachlorobiphenyl (BZ #52)	35693-99-3	I	10	32284
1,1,1,2-tetrachloroethane	630-20-6	PTM	2,000	30411
1,1,2,2-tetrachloroethane	79-34-5	PTM	2,000	30412
tetrachloroethene	127-18-4	PTM	2,000	30413
2,3,4,6-tetrachlorophenol	58-90-2	M	1,000	31402
2,4,5,6-tetrachloro-*m*-xylene (5 mL)	877-09-8	A	200	32028
2,4,5,6-tetrachloro-*m*-xylene	877-09-8	A	200	32027
n-tetracontane (C40)	4181-95-7	Neat	100 mg	31859
delta-8-tetrahydrocannabinol (THC)	5957-75-5	PTM	1,000	34090
tetrahydrofuran (THF)	109-99-9	DMSO	3.6 mg/mL	36408
tetrahydrofuran (THF)	109-99-9	PTM	2,000	30414
tetrahydrofuran-d8	1693-74-9	PTM	2,000	30112
tetralin	119-64-2	DMSO	0.5 mg/mL	36409
tetrapentyltin	3765-65-9	D	2,000	31475
tetra-*n*-propyltin	2176-98-9	D	2,000	31474
tetryl**	479-45-8	ACN	1,000	31667
delta-9-tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
(±)11-nor-9-carboxy-Δ^9-THC	104874-50-2	M	100	34068
delta-9-tetrahydrocannabinolic acid A (THCA-A)	23978-85-0	PTM	1,000	34093
thebaine	115-37-7	PTM	1,000	34009
Tinuvin P	2440-22-4	Ip	52	31629
toluene	108-88-3	DMSO	4.45 mg/mL	36410
toluene	108-88-3	PTM	2,000	30415
toluene-d8	2037-26-5	PTM	2,000	30224
toxaphene	8001-35-2	H	1,000	32005
toxaphene	8001-35-2	I	5,000	32071
toxaphene	8001-35-2	M	2,000	32015
2,4,5-TP (Silvex)	93-72-1	M	1,000	32245
2,4,5-TP (Silvex) methyl ester	4841-20-7	M	1,000	32246
transformer oil (PCB-free)	64742-53-6	Neat	50 mL	32425
transformer oil (PCB-free)	64742-53-6	Neat	5 mL	32424
n-triacontane-d62 (C30)	638-68-6	D	500	31816
triazolam	28911-01-5	PTM	1,000	34057
2,4,6-tribromophenol	118-79-6	M	1,000	31401
tributylphosphate	126-73-8	A	1,000	32280
tributyltin chloride	1461-22-9	D	2,000	31478
tricaprin (1,2,3-tricaprinoylglycerol)	621-71-6	pyridine	8,000	33025
tricaprin (1,2,3-tricaprinoylglycerol) (5 mL)	621-71-6	pyridine	8,000	33033
1,2,3-trichlorobenzene	87-61-6	PTM	2,000	30416
1,2,4-trichlorobenzene	120-82-1	M	1,000	31439
2,4,4' -trichlorobiphenyl (BZ #28)	7012-37-5	I	10	32283
1,1,1-trichloroethane	71-55-6	DMSO	50 mg/mL	36411
1,1,1-trichloroethane	71-55-6	PTM	2,000	30418
1,1,2-trichloroethane	79-00-5	PTM	2,000	30419
trichloroethene	79-01-6	DMSO	0.4 mg/mL	36412
trichloroethene	79-01-6	PTM	2,000	30420
trichlorofluoromethane (CFC-11)	75-69-4	PTM	2,000	30421
2,4,5-trichlorophenol	95-95-4	A	1,000	32017
2,4,5-trichlorophenol	95-95-4	M	1,000	31299
2,4,6-trichlorophenol	88-06-2	M	1,000	31400
1,2,3-trichloropropane	96-18-4	MTBE	1,000	31648
1,2,3-trichloropropane	96-18-4	PTM	2,000	30429
1,1,2-trichlorotrifluoroethane (CFC-113)	76-13-1	PTM	2,000	30462
α,α,α-trifluorotoluene	98-08-8	PTM	2,000	30048
α,α,α-trifluorotoluene	98-08-8	PTM	2,500	30068
α,α,α-trifluorotoluene	98-08-8	PTM	10,000	30083
trifluralin	1582-09-8	M	1,000	32238
1,2,4-trimethylbenzene	95-63-6	PTM	2,000	30422
1,3,5-trimethylbenzene	108-67-8	PTM	2,000	30423
1,2,4-trimethyl-5-nitrobenzene	610-91-3	M	2,000	33903
2,2,4-trimethylpentane (isooctane)	540-84-1	nonane	5% vol/vol	30671
1,3,5-trinitrobenzene**	99-35-4	ACN	1,000	31668
2,4,6-trinitrotoluene**	118-96-7	ACN	1,000	31669
triolein (1,2,3-tri[*cis*-octadecenoyl] glycerol)	122-32-7	pyridine	5,000	33023
tripentyltin chloride	3342-67-4	D	2,000	31477
triphenylmethane (5 mL)	519-73-3	ACN	10	33260
triphenylphosphate (5 mL)	115-86-6	ACN:acetic acid (99:1)	2	31964
triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
tri-*n*-propyltin chloride	995-25-5	D	2,000	31476
triphenylphosphate	115-86-6	A	1,000	32281
tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259
unleaded gasoline composite (5 mL)	8006-61-9	PTM	50,000	30206
unleaded gasoline composite	8006-61-9	PTM	2,500	30081
unleaded gasoline composite	8006-61-9	PTM	50,000	30205
unleaded gasoline: 25% weathered	8006-61-9	PTM	5,000	30097
unleaded gasoline: 50% weathered	8006-61-9	PTM	5,000	30098
unleaded gasoline: 75% weathered	8006-61-9	PTM	5,000	30099
unleaded gasoline: 99% weathered	8006-61-9	PTM	5,000	30436
unleaded gasoline: unweathered	8006-61-9	PTM	5,000	30096
used motor oil composite	64742-65-0	D	50,000	31465
γ-valerolactone	108-29-2	ACN	1,000	34080
vinyl acetate	108-05-4	PTM	2,000	30216
vinyl chloride	75-01-4	PTM	2,000	30089
vinyl chloride	75-01-4	PTM	2,500	30093
m-xylene	108-38-3	DMSO	6.51 mg/mL	36414
m-xylene	108-38-3	PTM	2,000	30424
o-xylene	95-47-6	DMSO	0.97 mg/mL	36415
o-xylene	95-47-6	PTM	2,000	30425
p-xylene	106-42-3	DMSO	1.52 mg/mL	36416
p-xylene	106-42-3	PTM	2,000	30426

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Ip = isopropanol
M = methanol
MTBE = methyl *tert*-butyl ether
PTM = purge-and-trap grade methanol
T = toluene
TO = transformer oil
W = water (DI)

Reference Standards

Column & Detector Test Mixes & Reagents

Deactivating Agent

Dimethyldichlorosilane (DMDCS) Deactivating Agent

- Easy deactivation of liners and other glass surfaces.
- Convenient—20 mL ampul deactivates 50 inlet liners.
- Tested to ensure consistent quality and effectiveness.

Restek offers dimethyldichlorosilane (DMDCS) for deactivating liners and other glassware. Simply dilute the neat material to a 5% solution in toluene, soak the glass item(s) in the solution for 15 minutes, and rinse with toluene and methanol. DMDCS reacts with active hydroxyl groups on the glass surface to produce a deactivated surface. A detailed procedure is included with the product.

Neat, 20 mL/ampul

cat.# 31840 (ea.)

No data pack available.

Derivatization Reagents

- Reagents available for acylation, alkylation, and silylation.
- Packaged in 10 x 1 g vials or 25 g vials.
- High purity for accurate results.

Derivatization Reagents

Acylation Derivatization Reagents

- Most commonly used for electron capture detection.
- React with alcohols, amines, and phenols.
- Frequently used for drugs of abuse confirmation.

Acylation reagents offer the same advantage available from silylation reagents: creating less polar, more volatile derivatives. In comparison to silylating reagents, the acylating reagents can more readily target highly polar multi-functional compounds, such as carbohydrates and amino acids. In addition, acylating reagents offer the distinct advantage of introducing electron-capturing groups, thus enhancing detectability during analysis.

Compound	CAS #	cat.#
MBTFA (N-methyl-bis-trifluoroacetamide)		
10-pk. (10x1 g)	685-27-8	35616
25 g vial	685-27-8	35617
TFAA (trifluoroacetic acid anhydride)		
10-pk. (10x1 g)	407-25-0	35618
25 g vial	407-25-0	35619
PFAA (pentafluoropropionic acid anhydride)		
10-pk. (10x1 g)	356-42-3	35620
25 g vial	356-42-3	35621
HFAA (heptafluorobutyric acid anhydride)		
10-pk. (10x1 g)	336-59-4	35622
25 g vial	336-59-4	35623
PFPOH (pentafluoropropanol)		
10-pk. (10x1 g)	422-05-9	35624
25 g vial	422-05-9	35625

Derivatization Reagents, *cont.*

Alkylation Derivatization Reagents

- Add alkyl groups to functional hydrogens (H).
- Decrease polarity on compounds containing acidic hydrogens, i.e., phenols, carboxylic acids.
- Form an ester.

Alkylation reagents reduce molecular polarity by replacing active hydrogens, such as carboxylic acids and phenols. Alkylation reagents can be used alone to form esters and amides, or they can be used in conjunction with acylation or silylation reagents. A two-step approach is commonly used in the derivatization of amino acids, where multiple functional groups of these compounds may necessitate protection during derivatization.

Esterification—the most popular method of alkylation due to the availability of reagents and ease of use—is the reaction of an acid with an alcohol in the presence of a catalyst. Alkyl esters are stable and can be formed quickly and quantitatively. Retention of the derivative can be varied by altering the length of the substituted alkyl group. In addition to the formation of simple esters, alkylation reagents can be used in extraction procedures where biological matrices are present.

Compound	CAS #	cat.#
TMPAH		
10-pk. (10x1 g)	1899-02-1	35614
25 g vial	1899-02-1	35615

Silylation Derivatization Reagents

- Replace active hydrogen, reducing polarity and making the compounds more volatile.
- Increase stability of derivatives.

Silylation is the most widely used derivatization procedure for sample analysis by GC. In silylation, an active hydrogen is replaced by an alkylsilyl group such as trimethylsilyl (TMS) or *tert*-butyldimethylsilyl (*tert*-BDMS). Silyl derivatives are more volatile, less polar, and more thermally stable. As a result, GC separation is improved and detection is enhanced.

Both TMS and *tert*-BDMS reagents are suitable for a wide variety of compounds and can be used for many GC applications. (Note that silylation reagents are generally moisture sensitive and must be sealed to prevent deactivation.)

Compound	CAS #	cat.#
MSTFA (N-methyl-N-trimethylsilytrifluoroacetamide)		
10-pk. (10x1 g)	24589-78-4	35600
25 g vial	24589-78-4	35601
MSTFA w/1% TMCS (N-methyl-N-trimethylsilytrifluoroacetamide w/1% trimethylchlorosilane)		
10-pk. (10x1 g)	24589-78-4	35602
25 g vial	24589-78-4	35603
BSTFA (N,O-bis[trimethylsilyl]trifluoroacetamide)		
10-pk. (10x1 g)	25561-30-2	35604
25 g vial	25561-30-2	35605
BSTFA w/1% TMCS (N,O-bis[trimethylsilyltrifluoroacetamide] w/1% trimethylchlorosilane)		
10-pk. (10x1 g)	25561-30-2	35606
25 g vial	25561-30-2	35607
MTBSTFA w/1% TBDMCS (N-methyl-N[*tert*-butyldimethylsilyl trifluoroacetamide] w/1% *tert*-butyldimethylchlorosilane)		
10-pk. (10x1 g)	77377-52-7	35608
25 g vial	77377-52-7	35610
TMCS (trimethylchlorosilane)		
10-pk. (10x1 g)	75-77-4	35611
25 g vial	75-77-4	35612

Detector Tuning Mixes

VOA Tuning Compound

4-bromofluorobenzene

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30003 (ea.)

SV Tuning Compound

decafluorotriphenylphosphine (DFTPP)

2,500 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31001 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

Neat, 1 g
cat.# 33027 (ea.)

No data pack available.

GC-MS Tuning Mixture (4 components)

benzidine
4,4'-DDT
decafluorotriphenylphosphine (DFTPP)
pentachlorophenol

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31615 (ea.)

GC Column & Detector Test Mixes

Amine Column Test Mix (8 components)

For Stabilwax®-DB, Rtx®-5 Amine, Rtx®-35 Amine, and Rtx®-Volatile Amine columns.

1,2-butanediol	0.60 mg/mL	diethanolamine	1.20
pyridine	0.60	2-nonanol	0.60
decane (C10)	0.60	2,6-dimethylaniline	0.60
diethylenetriamine	1.20	dodecane (C12)	0.60

In methylene chloride:methanol (1:1), 1 mL/ampul
cat.# 35002 (ea.)

No data pack available.

FID Performance Evaluation Standard (3 components)

n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)

0.03 w/w% each in hexane, 1 mL/ampul
cat.# 33908 (ea.)

GC-FID Test Mix (3 components)

n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)

20 µg/mL each in hexane, 1 mL/ampul
cat.# 35108 (ea.)

NEW!

GC Column & Detector Test Mixes, *cont.*

Grob Test Mix (12 components)

For use with temperature-programmed conditions.

*n*C10-FAME	0.42 mg/mL	2,6-dimethylphenol	0.32
*n*C11-FAME	0.42	2-ethylhexanoic acid	0.38
*n*C12-FAME	0.41	nonanal	0.40
2,3-butanediol	0.53	1-octanol	0.36
dicyclohexylamine	0.31	undecane (C11)	0.29
2,6-dimethylaniline	0.32	decane (C10)	0.28

In methylene chloride, 1 mL/ampul

cat.# 35000 (ea.)

No data pack available.

Inter-Polar Column Test Mix (11 components)

acetone	1.25 mg/mL	*n*-nonane (C9)	2.00
2-butanone (MEK)	1.25	*n*-octane (C8)	1.40
chlorobenzene	2.00	1-propanol	1.25
1,2-dichloropropane	2.00	pyridine	1.40
n-heptane (C7)	1.25	tetrachloroethylene	3.25
methanol	1.25		

In methylene chloride, 1 mL/ampul

cat.# 35076 (ea.)

NEW!

ISO-C14-C20 Column Test Mix (5 components)

n-tetradecane (C14)	*n*-octadecane (C18)
n-pentadecane (C15)	*n*-eicosane (C20)
n-hexadecane (C16)	

400 µg/mL each in cyclohexane, 1 mL/ampul

cat.# 35006 (ea.)

NEW!

OQ/PV Headspace Standard (3 components)

1,2-dichlorobenzene	*tert*-butyl disulfide
nitrobenzene	

2,000 µg/mL each in ethanol, 1 mL/ampul

cat.# 33909 (ea.)

OQ Response Linearity Test Standard (6 components)

n-heptadecane (C17)	1.5 µg/mL	*n*-eicosane (C20)	100
n-octadecane (C18)	10	*n*-docosane (C22)	1,000
n-nonadecane (C19)	2	*n*-tetracosane (C24)	10,000

In isooctane, 1 mL/ampul

cat.# 33906 (ea.)

Polar ISO Column Test Mix (8 components)

aniline	methyl dodecanoate
2-chlorophenol	*n*-nonadecane
2-dodecanol	2-nonanone
n-heptadecane	1-octanol

250 µg/mL each in 1,2-dichloroethane, 1 mL/ampul

cat.# 35103 (ea.)

NEW!

Q-BOND and U-BOND Column Test Mix (7 components)

acetone	*n*-hexane (C6)
diethyl ether (ethyl ether)	methanol
ethanol	*n*-pentane (C5)
ethyl acetate	

0.1% vol/vol each in heptane, 1 mL/ampul

cat.# 35202 (ea.)

Volatile Amine Column Test Mix (8 components)

1,2-butanediol	900 µg/mL	*n*-dodecane (C12)	900
diethanolamine (DEA)	1,800	*n*-nonane (C9)	900
diethylenetriamine	1,800	2-nonanol	900
2,6-dimethylaniline	900	pyridine	900

In methanol:dichloromethane (50:50), 1 mL/ampul

cat.# 35008 (ea.)

NEW!

XIL-350 Column Test Mix (8 components)

4-chlorophenol	1-methylnaphthalene
dicyclohexylamine	*n*-tetradecane (C14)
2-ethylhexanoic acid	*n*-tridecane (C13)
1,6-hexanediol	1-undecanol

350 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 35226 (ea.)

GPC Calibration Mixes

CLP GPC Calibration Mix (5 components)

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

bis(2-ethylhexyl) phthalate	10 mg/mL	perylene	0.2
corn oil	250	sulfur	0.8
methoxychlor	2.0		

In methylene chloride, 1 mL/ampul

cat.# 32019 (ea.)

In methylene chloride, 5 mL/ampul

cat.# 32023 (ea.)

No data pack available.

GPC Calibration Mixes, *cont.*

Revised GPC Calibration Mix (5 components)

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

bis(2-ethylhexyl) phthalate	5 mg/mL	perylene	0.2
corn oil	250	sulfur	0.8
methoxychlor	1.0		

In methylene chloride, 1 mL/ampul
cat.# 32041 (ea.)

In methylene chloride, 5 mL/ampul
cat.# 32042 (ea.)

No data pack available.

LC Column & Detector Test Mixes

LC Normal Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

benzene	1.00 mg/mL	benzyl alcohol	3.00
benzaldehyde	0.04	4-methoxybenzyl alcohol	2.00

In hexane, 1 mL/ampul
cat.# 35004 (ea.)

LC Reversed Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

benzene	3.00 mg/mL	naphthalene	0.50
uracil	0.02	biphenyl	0.06

In methanol:water (75:25), 1 mL/ampul
cat.# 35005 (ea.)

LC Performance Test Mix (5 components)

- Highly effective for characterizing LC column parameters.
- Simple, easy, reliable approach to Quality Control (QC) evaluations or column classification.
- Monitor column performance over time.

The National Institute of Standards and Technology (NIST) has formulated a mixture that is highly effective for characterizing LC columns for efficiency, void volume, methylene selectivity, retentiveness, and activity toward chelators and organic bases. Results can be used for column classification, for column selection, for monitoring column performance over time, or for quality control. We test our material against the NIST 870 standard.

amitriptyline hydrochloride	2,800 µg/mL	toluene	1,400
ethylbenzene	1,700	uracil	28
quinizarin	94		

In methanol, 1 mL/ampul
cat.# 31699 (ea.)

LC Column & Detector Test Mixes, *cont.*

Carbohydrate LC Performance Check Mix (5 components)

Performance qualification (PQ) determines the precision of the LC system. Our performance check mix for LC-RI consists of five simple sugars in varied concentrations. We prepare the reference material in water, dehydrate it, and package it dry for enhanced stability.

glucose	2.1 mg	maltose	4.5
fructose	2.0	sucrose	4.0
lactose	4.4		

Dry components in 4 mL screw-cap vial. Reconstitute in 1 mL acetonitrile:water (75:25) to 2.1, 2.0, 4.4, 4.5, 4.0 mg/mL, respectively.
cat.# 31809 (ea.)

No data pack available.

LC OQ Wavelength Accuracy Standard

erbium perchlorate

10 mg/mL in water, 5 mL/ampul
cat.# 31053 (ea.)

NEW!

No data pack available.

LC OQ Gradient Standard

acetone

Neat, 1 mL/ampul
cat.# 30012 (ea.)

NEW!

No data pack available.

LC OQ Linearity Test Mix Kit

Linear detector responses to concentration variations are an important part of operation qualification (OQ) for LC instruments. Our kit of five aqueous solutions of caffeine can be used to generate simple plots of UV response versus concentration. Certificate of analysis includes caffeine concentration, calculated variance in preparing each mixture, a linearity plot, and coefficient of determination (r^2) for the linear plot.

Contains 1 mL each of these mixtures.
31804: Caffeine (caffeine at 5 µg/mL in water)
31803: Caffeine (caffeine at 25 µg/mL in water)
31802: Caffeine (caffeine at 125 µg/mL in water)
31801: Caffeine (caffeine at 250 µg/mL in water)
31800: Caffeine (caffeine at 500 µg/mL in water)
cat.# 31805 (kit)

NEW! kit

No data pack available.

LC OQ Standards Kit

Contains the following:
30012: LC OQ Gradient Standard, 1 mL
31053: LC OQ Wavelength Accuracy Standard, 5 mL
31068: LC OQ Linearity Kit, 6 - 1 mL/ampuls
cat.# 31069 (kit)

NEW! kit

No data pack available.

Reference Standards

Clinical, Forensic & Toxicology

Bank Dye Standard (MAAQ)

Bank Dye Standard (MAAQ)

Restek offers this qualitative standard (red dye used in bank "Security Packs") to help investigators in municipal police stations and criminal laboratories fight crime.

1-N-(methylamino)anthraquinone (MAAQ)

100 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31823 (ea.)

No data pack available.

Blood Alcohol Standards

Blood Alcohol Standards (Calibration)

- NIST-traceable ethanol calibration standards.
- Calibration mixtures ranging from 0.010 g/dL to 0.40 g/dL in water.
- Data pack and certificate of analysis for each standard available on our website.

We have developed calibration mixtures for performing multi-point instrument calibrations so that laboratories can construct calibration curves. The data pack (which can be downloaded from our website at www.restek.com/datapacks) includes a certificate of analysis, raw material testing results, statistical QA results, analytical balance printout, and gravimetric weight of each analyte. Ethanol in these mixes is National Institute of Standards and Technology (NIST)-traceable.

Compound	qty.	cat.#
0.010 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36276
1 mL/ampul	10-pk.	36278
0.015 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36232
1 mL/ampul	10-pk.	36332
20 mL/ampul	ea.	36248
0.02 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36233
1 mL/ampul	10-pk.	36333
20 mL/ampul	ea.	36249
0.025 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36234
1 mL/ampul	10-pk.	36334
0.04 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36235
1 mL/ampul	10-pk.	36335
20 mL/ampul	ea.	36251
0.05 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36257
1 mL/ampul	10-pk.	36259
20 mL/ampul	ea.	36260
0.08 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36262
1 mL/ampul	10-pk.	36264
20 mL/ampul	ea.	36265
0.1 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36236
1 mL/ampul	10-pk.	36336
20 mL/ampul	ea.	36252

Blood Alcohol Standards, *cont.*

Compound	qty.	cat.#
0.15 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36237
1 mL/ampul	10-pk.	36337
20 mL/ampul	ea.	36253
0.2 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36238
1 mL/ampul	10-pk.	36338
20 mL/ampul	ea.	36254
0.3 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36239
1 mL/ampul	10-pk.	36339
20 mL/ampul	ea.	36255
0.4 g/dL forensic ethanol solution		
1 mL/ampul	5-pk.	36266
1 mL/ampul	10-pk.	36268
20 mL/ampul	ea.	36269

Blood Alcohol Standards (Control)

Use to verify the retention time for each compound normally included in a blood alcohol test and to verify that the compounds are resolved from and do not interfere with one another.

Blood Alcohol Mix Resolution Control Standard

(8 components)

acetaldehyde
acetone
acetonitrile
ethanol
ethyl acetate
isopropanol
methanol
methyl ethyl ketone

0.100 g/dL each in water, 1 mL/ampul

cat.# 36256 (ea.)

BAC Resolution Control Standard *n*-P (6 components)

- Includes 1-propanol internal standard.
- Intended for qualitative use only.

acetaldehyde
acetone
ethanol (BAC)
methanol
1-propanol (*n*-propanol)
2-propanol (isopropanol)

NEW!

100 mg/dL each in water, 1 mL/ampul

cat.# 36010 (ea.)

No data pack available.

BAC Resolution Control Standard *t*-B (6 components)

- Includes *tert*-butanol internal standard.
- Intended for qualitative use only.

acetaldehyde
acetone
tert-butanol (TBA)
ethanol (BAC)
methanol
2-propanol (isopropanol)

NEW!

100 mg/dL each in water, 1 mL/ampul

cat.# 36011 (ea.)

No data pack available.

Cannabinoids (Medical Marijuana)

Cannabinoids Standard (3 components)

cannabidiol
cannabinol
delta-9-tetrahydrocannabinol (Δ^9-THC)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 34014 (ea.)

NEW!

Medical Marijuana Singles

NEW!

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
cannabichromene	20675-51-8	PTM	1,000	34092
cannabidiol	13956-29-1	PTM	1,000	34011
cannabigerol	25654-31-3	PTM	1,000	34091
cannabinol	521-35-7	PTM	1,000	34010
delta-8-tetrahydrocannabinol (THC)	5957-75-5	PTM	1,000	34090
delta-9-tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
delta-9-tetrahydrocannabinolic acid A (THCA-A)	23978-85-0	PTM	1,000	34093
tetrahydrofuran-d8	1693-74-9	PTM	2,000	30112
(±)11-nor-9-carboxy-Δ^9-THC	104874-50-2	M	100	34068

M = methanol; PTM = purge-and-trap grade methanol

Exempted Drug of Abuse Standards

Exempted Drug of Abuse Reference Standards

Concentration is µg/mL. Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Benzodiazepines				
alprazolam	28981-97-7	PTM	1,000	34042
bromazepam	1812-30-2	PTM	1,000	34043
chlordiazepoxide	438-41-5	PTM	1,000	34044
clobazam	22316-47-8	PTM	1,000	34045
clonazepam	1622-61-3	PTM	1,000	34046
diazepam	439-14-5	PTM	1,000	34047
flunitrazepam	1622-62-4	PTM	1,000	34049
flurazepam	1172-18-5	PTM	1,000	34050
lorazepam	846-49-1	PTM	1,000	34051
nitrazepam	146-22-5	PTM	1,000	34053
oxazepam	604-75-1	PTM	1,000	34054
prazepam	2955-38-6	PTM	1,000	34055
temazepam	896-50-4	PTM	1,000	34056
triazolam	28911-01-5	PTM	1,000	34057
Cocaine & Metabolites				
cocaethylene	529-38-4	ACN	1,000	34066
cocaine	53-21-4	PTM	1,000	34015
benzoylecgonine	519-09-5	PTM	1,000	34016
ecgonine	5796-31-6	PTM	1,000	34017
ecgonine methyl ester	38969-40-3	PTM	1,000	34018
Methadone & Metabolites				
EDDP perchlorate	66729-78-0	M	1,000	34069
methadone	1095-90-5	PTM	1,000	34005
Amphetamines & Metabolites				
d-amphetamine	51-63-8	PTM	1,000	34020
(+)methamphetamine	51-57-0	PTM	1,000	34021
3,4-MDA HCl	4764-17-4	M	1,000	34070
3,4-MDEA HCl	82801-81-8	M	1,000	34072
3,4-MDMA HCl	64057-70-1	M	1,000	34071
phenylpropanolamine HCl	154-41-6	M	1,000	34073
Opiates & Metabolites				
codeine	76-57-3	PTM	1,000	34000
dextromethorphan HBr monohydrate	125-69-9	M	1,000	34081
hydrocodone	34195-34-1	PTM	1,000	34002
hydromorphone	71-68-1	PTM	1,000	34063
morphine	6211-15-0	PTM	1,000	34006
oxycodone	124-90-3	PTM	1,000	34007
oxymorphone	76-41-5	PTM	1,000	34065
Cannabinoid & Metabolites				
cannabichromene	20675-51-8	PTM	1,000	34092
cannabidiol	13956-29-1	PTM	1,000	34011
cannabigerol	25654-31-3	PTM	1,000	34091
cannabinol	521-35-7	PTM	1,000	34010
delta-9-tetrahydrocannabinol (THC)	1972-08-3	M	1,000	34067
(±)11-nor-9-carboxy-Δ^9-THC	104874-50-2	M	100	34068
Barbiturates				
amobarbital	64-43-7	PTM	1,000	34028
aprobarbital	77-02-1	PTM	1,000	34029
barbital	57-44-3	PTM	1,000	34030
butabarbital	125-40-6	PTM	1,000	34031
butalbital	77-26-9	PTM	1,000	34032
DL-glutethimide	18389-24-7	PTM	1,000	34058
hexobarbital	56-29-1	PTM	1,000	34033
mephobarbital	115-38-8	PTM	1,000	34034
methohexital	151-83-7	PTM	1,000	34035
pentobarbital	76-74-4	PTM	1,000	34036
phenobarbital	50-06-6	PTM	1,000	34037
secobarbital	29071-21-4	PTM	1,000	34038
talbutal	115-44-6	PTM	1,000	34039

Exempted Drug of Abuse Standards, *cont.*

Compound	CAS #	Solvent	Conc.	cat.#
GHB				
1,4-butanediol	110-63-4	M	1,000	34078
γ-butyrolactone (GBL)	96-48-0	ACN	1,000	34077
α-methylene-γ-butyrolactone (AMGBL)	547-65-9	ACN	1,000	34079
γ-valerolactone	108-29-2	ACN	1,000	34080
Other				
benzphetamine	5411-22-3	PTM	1,000	34022
caffeine	58-08-2	M	1,000	34084
continine	486-56-6	M	1,000	34086
fentanyl	437-38-7	M	1,000	34082
nor-fentanyl oxalate	1609-66-1	M	1,000	34083
levorphanol	5985-38-6	PTM	1,000	34003
meperidine	50-13-5	PTM	1,000	34004
meprobamate	57-53-4	PTM	1,000	34059
methaqualone	340-56-7	PTM	1,000	34064
methyprylon	125-64-4	PTM	1,000	34060
nicotine	54-11-5	M	1,000	34085
pentazocine	64024-15-3	PTM	1,000	34062
phencyclidine	956-90-1	PTM	1,000	34027
phendimetrazine	50-58-8	PTM	1,000	34025
phenmetrazine	1707-14-8	PTM	1,000	34026
phentermine	1197-21-3	PTM	1,000	34024
dextro-propoxyphene	1639-60-7	PTM	1,000	34008
thebaine	115-37-7	PTM	1,000	34009

ACN = acetonitrile; M = methanol; PTM = purge-and-trap grade methanol

Forensic Drug Screen Test Mixture (8 components)

amiodarone	10 µg/mL	diazepam	10
amphetamine	10	doxepine	10
caffeine	10	haloperidol	1
codeine	10	morphine	10

In P&T methanol, 1 mL/ampul

cat.# 36340 (ea.)

Forensic Drug Screen Internal Standard (2 components)

D5-diazepam
D5-doxepine

10 µg/mL each in P&T methanol, 10 mL/ampul

cat.# 36341 (ea.)

Explosives Solutions

Single-Component Explosives Solutions

- Supports U.S. Department of Defense base closures and remediation.
- Mixtures and singles supporting LC U.S. EPA Method 8330.
- Mixtures and singles supporting GC-ECD U.S. EPA Method 8095.
- Internal standards and surrogates to support both methods.

These materials support nitroaromatic, nitramine, and nitroester analyses by GC-ECD (Method 8095).[1,2] Compounds listed are explosives, manufacturing intermediates, or degradation products. Method 8095 mixtures contain the components at concentration ratios appropriate for ECD.

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-amino-4,6-dinitrotoluene	35572-78-2	ACN	1,000	31670
4-amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
ammonium picrate*	131-74-8	ACN	2,000	31890
3,5-dinitroaniline	618-87-1	ACN	1,000	31661
1,2-dinitrobenzene	528-29-0	M	1,000	31453
1,3-dinitrobenzene	99-65-0	ACN	1,000	31662
2,4-dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-dinitrotoluene	610-39-9	EA	2,000	33901
3,4-dinitrotoluene	610-39-9	M	1,000	31452
EGDN*	628-96-6	M	1,000	31601
HMX*	2691-41-0	ACN	1,000	31665
2-methyl-4-nitroaniline	99-55-8	M	1,000	31612
nitrobenzene	98-95-3	ACN	1,000	31657
nitroglycerin*	55-63-0	M	1,000	31498
nitroguanidine*	556-88-7	M	1,000	31602
2-nitrotoluene	88-72-2	ACN	1,000	31659
3-nitrotoluene	99-08-1	ACN	1,000	31660
4-nitrotoluene	99-99-0	ACN	1,000	31658
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
picric acid*	88-89-1	M	1,000	31499
propylene glycol dinitrate (PGDN)	6423-43-4	M	1,000	31821
RDX*	121-82-4	ACN	1,000	31666
tetryl*	479-45-8	ACN	1,000	31667
1,3,5-trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-trinitrotoluene*	118-96-7	ACN	1,000	31669

ACN = acetonitrile; EA = ethyl acetate; M = methanol

*Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

References (Not available from Restek)

[1]U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.

[2]M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406–416, August 1998.

ASTM E1387 and E1618 (Fire Debris Analysis)

These materials also can be used for underground storage tank monitoring.

E1387 Column Resolution Check Mix (13 components)

n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
2-ethyltoluene
3-ethyltoluene
toluene
1,2,4-trimethylbenzene
p-xylene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31224 (ea.)

E1618 Test Mix (13 components)

Components in this mix (0.5 µL/mL or 0.05% volume/volume each) are at 10x the concentration of the final test solution specified in ASTM 1618 and ASTM 1387.

n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
2-ethyltoluene
3-ethyltoluene
toluene
1,2,4-trimethylbenzene
p-xylene

0.05% volume/volume each in methylene chloride, 1 mL/ampul
cat.# 31613 (ea.)

No data pack available.

please note

We can custom prepare weathered accelerants for fire debris analysis.

Please complete the custom reference material request form at **www.restek.com/solutions**

We'll be glad to work with you!

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Weathered Petrochemical Solutions

Weathered Petrochemical Standards

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30487 (ea.)

We prepare our mineral spirit solutions from an equal-volume blend of Type I, II, and III mineral spirits.

Concentration is µg/mL. Volume is 1 mL/ampul unless otherwise noted.

Unleaded Gasoline	CAS #	Solvent	Conc.	cat.#
unleaded gasoline: unweathered	8006-61-9	PTM	5,000	30096
unleaded gasoline: 25% weathered	8006-61-9	PTM	5,000	30097
unleaded gasoline: 50% weathered	8006-61-9	PTM	5,000	30098
unleaded gasoline: 75% weathered	8006-61-9	PTM	5,000	30099
unleaded gasoline: 99% weathered	8006-61-9	PTM	5,000	30436
Kerosene	**CAS #**	**Solvent**	**Conc.**	**cat.#**
kerosene: unweathered	84742-81-0	D	5,000	31229
kerosene: 25% weathered	84742-81-0	D	5,000	31230
kerosene: 50% weathered	84742-81-0	D	5,000	31231
kerosene: 75% weathered	84742-81-0	D	5,000	31232
Diesel Fuel #2	**CAS #**	**Solvent**	**Conc.**	**cat.#**
diesel fuel #2: unweathered	68334-30-5	D	5,000	31233
diesel fuel #2: 25% weathered	68334-30-5	D	5,000	31234
diesel fuel #2: 50% weathered	68334-30-5	D	5,000	31235
diesel fuel #2: 75% weathered	68334-30-5	D	5,000	31236
Mineral Spirits	**CAS #**	**Solvent**	**Conc.**	**cat.#**
mineral spirits: unweathered	8030-30-6	D	5,000	31225
mineral spirits: unweathered	8030-30-6	D	50,000	31260
mineral spirits: unweathered (5 mL)	8030-30-6	D	50,000	31261
mineral spirits: 25% weathered	8030-30-6	D	5,000	31226
mineral spirits: 50% weathered	8030-30-6	D	5,000	31227
mineral spirits: 75% weathered	8030-30-6	D	5,000	31228

D = methylene chloride
PTM = purge-and-trap grade methanol

Weathered Petrochemical Solutions, *cont.*

Weathered Gasoline Kit

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

Contains 1 mL each of these mixtures.
30096: Unleaded Gasoline Standard
30097: Unleaded Gasoline Standard: 25% Weathered
30098: Unleaded Gasoline Standard: 50% Weathered
30099: Unleaded Gasoline Standard: 75% Weathered

cat.# 30100 (kit) — kit

Weathered Gasoline Kit #2

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material. Samples of regular- and premium-grade unleaded gasoline were collected, then blended in equal volumes.

Contains 1 mL each of these mixtures.
30096: Unleaded Gasoline Standard
30097: Unleaded Gasoline Standard: 25% Weathered
30098: Unleaded Gasoline Standard: 50% Weathered
30099: Unleaded Gasoline Standard: 75% Weathered
30436: Unleaded Gasoline Standard: 99% Weathered

cat.# 30437 (kit) — kit

Weathered Kerosene Kit

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material.

Contains 1 mL each of these mixtures.
31229: Kerosene Standard
31230: Kerosene Standard: 25% Weathered
31231: Kerosene Standard: 50% Weathered
31232: Kerosene Standard: 75% Weathered

cat.# 31238 (kit) — kit

Weathered Diesel Fuel #2 Kit

These solutions are prepared from a single-source (one-refinery) product. The weathered materials indicate the percent weight loss from the original material.

Contains 1 mL each of these mixtures.
31233: Diesel Fuel #2 Standard
31234: Diesel Fuel #2 Standard: 25% Weathered
31235: Diesel Fuel #2 Standard: 50% Weathered
31236: Diesel Fuel #2 Standard: 75% Weathered

cat.# 31239 (kit) — kit

Weathered Mineral Spirits Kit

The solutions listed below were prepared from an equal-volume blend of Type I, II, and III mineral spirits.

Contains 1 mL each of these mixtures.
31225: Mineral Spirits Standard
31226: Mineral Spirits Standard: 25% Weathered
31227: Mineral Spirits Standard: 50% Weathered
31228: Mineral Spirits Standard: 75% Weathered

cat.# 31237 (kit) — kit

Reference Standards

Environmental

Acetates

8260B Acetate Mix (5 components)

vinyl acetate
ethyl acetate
isopropyl acetate
n-propyl acetate
n-butyl acetate

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30477 (ea.)

8260B Acetate Mix (Revised) (7 components)

- Includes methyl acetate and *n*-amyl acetate.
- Contains 7 acetates.

n-amyl acetate
butyl acetate
ethyl acetate
isopropyl acetate
methyl acetate
propyl acetate
vinyl acetate

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30489 (ea.)

Vinyl Acetate

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30216 (ea.)

Alcohols

8240 Alcohols Mix (5 components)

allyl alcohol
2-chloroethanol
ethanol
isobutyl alcohol
propargyl alcohol

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30214 (ea.)

Aldehydes

Method 8315 (Aldehydes & Ketones DNPH by LC)

Aldehyde-Ketone-DNPH TO-11A Calibration Mix (15 components)

acetaldehyde-DNPH
acetone-DNPH
acrolein-DNPH
benzaldehyde-DNPH
n-butyraldehyde-DNPH
crotonaldehyde-DNPH
2,5-dimethylbenzaldehyde-DNPH
formaldehyde-DNPH
hexaldehyde-DNPH
isovaleraldehyde-DNPH
propionaldehyde-DNPH
m-tolualdehyde-DNPH
o-tolualdehyde-DNPH
p-tolualdehyde-DNPH
valeraldehyde-DNPH

15 µg/mL each in acetonitrile, 1 mL/ampul*
cat.# 31808 (ea.)

*Concentration calculated as the aldehyde/ketone.

Formaldehyde-DNPH Mix

500 µg/mL in acetonitrile, 1 mL/ampul*
cat.# 31837 (ea.)

*Concentration calculated as the aldehyde/ketone.

Aldehydes, *cont.*

CARB 1004 Aldehyde/Ketone-DNPH Calibration Standard (13 components)

acetaldehyde-2,4-DNPH
acetone-2,4-DNPH
acrolein-2,4-DNPH
benzaldehyde-2,4-DNPH
n-butyraldehyde-2,4-DNPH
crotonaldehyde-2,4-DNPH
formaldehyde-2,4-DNPH
hexaldehyde-2,4-DNPH
methacrolein-2,4-DNPH
methyl ethyl ketone-2,4-DNPH
propionaldehyde-2,4-DNPH
m-tolualdehyde-2,4-DNPH
valeraldehyde-2,4-DNPH

3 µg/mL each in acetonitrile, 1 mL/ampul*
cat.# 33093 (ea.)

*Concentration calculated as the aldehyde/ketone.

DNPH Reference Materials

Volume is 1 mL/ampul. Concentration is µg/mL.*

Compound	CAS #	Solvent	Conc.	cat.#
acetaldehyde-2,4-DNPH	1019-57-4	ACN	100	33074
formaldehyde-2,4-DNPH	1081-15-8	ACN	100	33082
glycolaldehyde-2,4-DNPH		ACN	100	33091

*Concentration calculated as the aldehyde/ketone.
ACN = acetonitrile

ASTM Method 5197 (Formaldehyde and Other Carbonyl Compounds in Air)

See cat. #s 33093, 33074, 33082, and 33091 above.

Base, Neutral & Acid Extractable (BNA)/ Semivolatile Organics

See pages 496–508.

Benzidines

605 Benzidines Calibration Mix (2 components)

benzidine
3,3'-dichlorobenzidine

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31030 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

8270 Benzidines Mix (3 components)

benzidine
3,3'-dichlorobenzidine
3,3'-dimethylbenzidine

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31688 (ea.)
2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31852 (ea.)

3,3'-Dichlorobenzidine

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 31026 (ea.)
2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31835 (ea.)

BTEX

BTEX Standard (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

BTEX Gas Mix (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas
@ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

NEW!

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

NEW!

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

also available
Gas Regulators

See **pages 279–281.**

Diesel Fuel

Diesel Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-chlorooctadecane	3386-33-2	D	10,000	31098
2-fluorobiphenyl	321-60-8	D	10,000	31096
o-terphenyl	84-15-1	D	10,000	31097
p-terphenyl	92-94-4	D	10,000	31095

Recommended Internal Standards

Compound	CAS #	Solvent	Conc.	cat.#
5-α-androstane	438-22-2	D	2,000	31065
o-terphenyl	84-15-1	A	2,000	31066

A = acetone; D = methylene chloride

Diesel Fuel #2 Composite Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31259 (ea.)

Diesel Fuel #2 Standard

Prepared from a single-source (one-refinery) product.

diesel fuel #2: unweathered

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31233 (ea.)

Certified PAHs in Diesel (7 components)

- Confirms diesel #2 TPH and priority PAHs in a single analysis.
- Certificate of analysis includes concentration of TPH and certified concentrations of individual PAHs.
- Complete data packs available.

Certified PAHs
acenaphthene*
acenaphthylene*
fluorene*
1-methylnaphthalene*
2-methylnaphthalene*
naphthalene*
phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul
cat.# 31673 (ea.)

*Concentration differs from lot to lot. See online certificate of analysis for certified concentrations.

Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

diesel:biodiesel (80:20)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

Diesel Fuel, *cont.*

EPA Ultra Low Sulfur Diesel Precision Sample #1

EPA Section 80.580–80.585 Title 40, Chapter 1, Part 80

Homogenous, commercially available diesel fuel with sulfur content of 5–15 ppm. 1 x 200 mL amber bottle.

cat.# 33051 (ea.)

EPA Low Sulfur Diesel Precision Sample #2

EPA Section 80.580–80.585 Title 40, Chapter 1, Part 80

Homogenous, commercially available diesel fuel with sulfur content of 200–500 ppm. 1 x 200 mL amber bottle.

cat.# 33052 (ea.)

EPA Ultra Low Sulfur Diesel Accuracy Standard #1

EPA Section 80.520(a)(1) and 80.510(b)

1–10 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 15 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33053 (ea.)

EPA Ultra Low Sulfur Diesel Accuracy Standard #2

EPA Section 80.520(a)(1) and 80.510(b)

10–20 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 15 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33054 (ea.)

EPA Low Sulfur Diesel Accuracy Standard #3

EPA Section 80.520(c) and 80.510(c)

100–200 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 500 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33055 (ea.)

EPA Low Sulfur Diesel Accuracy Standard #4

EPA Section 80.520(c) and 80.510(c)

400–500 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 500 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33056 (ea.)

ISO/DIS 9377 Water Quality Testing (German H-53)

Reference mixtures for ISO/DIS 9377 (German H-53), a gas chromatography–flame ionization detection (GC-FID) method.

Diesel #2/Motor Oil (2 components)

diesel fuel #2 composite
motor oil

5,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31682 (ea.)

Diesel #2/Mineral Oil (2 components)

diesel fuel #2 composite
mineral oil

5,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31676 (ea.)

Standard Mixture Stock Solution (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

diesel #2 (additive-free)
mineral oil (additive-free [i.e., USP grade] bp 325–460 or C18–C32 retention time range)

5,000 µg/mL each in cyclohexane, 1 mL/ampul (prepares 8 mL of 1.25 µg/µL calibration curve high point). Total hydrocarbon concentration is 10,000 µg/mL.

cat.# 31630 (ea.)

Quality Control Standard Mixture, Revised

(2 components)

- Updated reference materials for GC analysis of TPH in water.
- Determination of hydrocarbon oil index—applicable to drinking, surface, waste, and treated water.

diesel #2 (additive-free)
motor oil (additive-free bp 325–460 or C18–C32 retention time range)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one 900 mL quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.

cat.# 31641 (ea.)

Quality Control Standard Mixture (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Environmentally safer than previous methods.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

diesel #2 (additive-free)
mineral oil (additive-free [i.e., USP grade] bp 391–522 or C24–C40 retention time range)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.

cat.# 31631 (ea.)

Disinfection By-Products

Disinfection By-Product and Chlorinated Solvents Mix
(19 components)

bromochloroacetonitrile
bromodichloromethane
bromoform
carbon tetrachloride
chloroform
chloropicrin
dibromoacetonitrile
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dichloroacetonitrile
1,1-dichloro-2-propanone
tetrachloroethylene
trichloroacetonitrile
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethylene
1,2,3-trichloropropane
1,1,1-trichloro-2-propanone

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 30615 (ea.)

Chloral Hydrate

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 30609 (ea.)

Disinfection By-Product Mix (7 components)

bromochloroacetonitrile
chloropicrin
dibromoacetonitrile
dichloroacetonitrile
1,1-dichloro-2-propanone
trichloroacetonitrile
1,1,1-trichloro-2-propanone

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 30616 (ea.)

Drinking Water Odor

Drinking Water Odor Standard (2 components)

- Reference mix of the two most common odor-causing compounds.
- Convenient concentration for purge-and-trap analysis: 100 µg/mL in methanol.

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10 ppt) and purge-and-trap analyses usually are used to quantify them.

(+/-)-geosmin
2-methylisoborneol

100 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30608 (ea.)

Ethylene Oxide

Ethylene Oxide

500 µg/mL in dimethyl sulfoxide, 1 mL/ampul
cat.# 36005 (ea.)

50 mg/mL in methylene chloride, 1 mL/ampul
cat.# 30620 (ea.)

NEW!

Ethylene oxide is available in other solvents and concentrations. Request your custom formulation at **www.restek.com/solutions**

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Explosives

Method 529 (Nitroaromatics & Nitramines)

529 Internal Standard Mix

3,4-dinitrotoluene

2,000 µg/mL in ethyl acetate, 1 mL/ampul

cat.# 33901 (ea.)

529 Surrogate Standard #1

2-nitromesitylene

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 33902 (ea.)

529 Surrogate Standard #2

1,2,4-trimethyl-5-nitrobenzene

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 33903 (ea.)

529 Surrogate Standard #3

nitrobenzene-d5

2,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31044 (ea.)

Nitroaromatics and Nitramine Explosives in Drinking Water (14 components)

3,5-dinitroaniline
1,3-dinitrobenzene
2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
2,4-dinitrotoluene
2,6-dinitrotoluene
nitrobenzene
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
RDX
tetryl
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 33900 (ea.)

Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

Method 609 (Nitroaromatics/Isophorone)

609 Nitroaromatics & Isophorone Calibration Mix

(4 components)

2,4-dinitrotoluene
isophorone
2,6-dinitrotoluene
nitrobenzene

2,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31033 (ea.)

Method 8095 (Explosives by GC)

8095 Surrogate

3,4-dinitrotoluene

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 31452 (ea.)

8095 Surrogate

2-methyl-4-nitroaniline

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 31612 (ea.)

8095 Matrix Spike Mix A (10 components)

2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
1,3-dinitrobenzene
2,4-dinitrotoluene
2,6-dinitrotoluene
HMX*
RDX
tetryl
1,3,5-trinitrobenene
2,4,6-trinitrotoluene

200 µg/mL each in acetonitrile (*HMX at 2,000 µg/mL), 1 mL/ampul

cat.# 31609 (ea.)

Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

8095 Matrix Spike Mix B (7 components)

3,5-dinitroaniline*
nitrobenzene
nitroglycerine
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
PETN

1,000 µg/mL each in acetonitrile (*3,5-dinitroaniline at 200 µg/mL), 1 mL/ampul

cat.# 31610 (ea.)

Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

8095 Calibration Mix A (10 components)

2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
1,3-dinitrobenzene
2,4-dinitrotoluene
2,6-dinitrotoluene
HMX
RDX
tetryl
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31607 (ea.)

Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

8095 Calibration Mix B (7 components)

3,5-dinitroaniline*
nitrobenzene
nitroglycerine
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
PETN

5,000 µg/mL each in acetonitrile (*3,5-dinitroaniline at 1,000 µg/mL), 1 mL/ampul

cat.# 31608 (ea.)

Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

Explosives, *cont.*

Method 8095 (Explosives by GC), *cont.*

Single-Component Explosives Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-amino-4,6-dinitrotoluene	35572-78-2	ACN	1,000	31670
4-amino-2,6-dinitrotoluene	19406-51-0	ACN	1,000	31671
ammonium picrate*	131-74-8	ACN	2,000	31890
3,5-dinitroaniline	618-87-1	ACN	1,000	31661
1,2-dinitrobenzene	528-29-0	M	1,000	31453
1,3-dinitrobenzene	99-65-0	ACN	1,000	31662
2,4-dinitrotoluene	121-14-2	ACN	1,000	31663
2,6-dinitrotoluene	606-20-2	ACN	1,000	31664
3,4-dinitrotoluene	610-39-9	EA	2,000	33901
3,4-dinitrotoluene	610-39-9	M	1,000	31452
EGDN*	628-96-6	M	1,000	31601
HMX*	2691-41-0	ACN	1,000	31665
2-methyl-4-nitroaniline	99-55-8	M	1,000	31612
nitrobenzene	98-95-3	ACN	1,000	31657
nitroglycerin*	55-63-0	M	1,000	31498
nitroguanidine*	556-88-7	M	1,000	31602
2-nitrotoluene	88-72-2	ACN	1,000	31659
3-nitrotoluene	99-08-1	ACN	1,000	31660
4-nitrotoluene	99-99-0	ACN	1,000	31658
PETN (pentaerythritol tetranitrate)*	78-11-5	M	1,000	31600
picric acid*	88-89-1	M	1,000	31499
propylene glycol dinitrate (PGDN)	6423-43-4	M	1,000	31821
RDX*	121-82-4	ACN	1,000	31666
tetryl*	479-45-8	ACN	1,000	31667
1,3,5-trinitrobenzene*	99-35-4	ACN	1,000	31668
2,4,6-trinitrotoluene*	118-96-7	ACN	1,000	31669

ACN = acetonitrile; EA = ethyl acetate; M = methanol

*Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

References (Not available from Restek)

[1]U.S. Environmental Protection Agency. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. SW-846, Proposed Draft Update IVB, Office of Solid Waste, Washington, DC, 1999.

[2]M. E. Walsh, T. Ranney, J. Chromatogr. Sci., Vol. 36, pp. 406–416, August 1998.

Method 8330 (Nitroaromatics and Nitramines by LC)

8330 Internal Standard

3,4-dinitrotoluene

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 31452 (ea.)

8330 Internal Standard

1,4-dinitrobenzene

2,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 33205 (ea.)

8330 Surrogate

1,2-dinitrobenzene

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 31453 (ea.)

Method 8330 (Nitroaromatics and Nitramines by LC), *cont.*

8330B Nitroaromatics and Nitramine Mix

(17 components)*

2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
3,5-dinitroaniline
1,3-dinitrobenzene
2,4-dinitrotoluene
2,6-dinitrotoluene
HMX
nitrobenzene
nitroglycerin
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
PETN
RDX
tetryl
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 33204 (ea.)

Nitroaromatics and Nitramine Explosives by LC

(14 components)*

1,3-dinitrobenzene
2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
2,4-dinitrotoluene
2,6-dinitrotoluene
HMX
nitrobenzene
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
RDX
tetryl
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 33905 (ea.)

8330 Calibration Mix #1 (7 components)*

1,3-dinitrobenzene
2,4-dinitrotoluene
HMX
nitrobenzene
RDX
1,3,5-trinitrobenzene
2,4,6-trinitrotoluene

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31450 (ea.)

8330 Calibration Mix #2 (7 components)*

2-amino-4,6-dinitrotoluene
4-amino-2,6-dinitrotoluene
2,6-dinitrotoluene
2-nitrotoluene
3-nitrotoluene
4-nitrotoluene
tetryl

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31451 (ea.)

*Meet all DOT requirements. Available only to customers or distributors inside the 48 contiguous United States; items may not be resold for export.

did you know?

When you order reference materials for Method 8330, be aware that obtaining pure, neat compounds for standards can be very difficult. Some of these commercial-grade materials contain desensitizing agents such as beeswax, water, or other manufacturing by-products. Many are shipped wet and must be carefully dried before preparation.

To ensure the highest quality standards, Restek's Quality Control (QC) lab confirms the chemical identity and purity of mixture components and solvents using one or more of the following techniques: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point. All compounds are 98% pure or higher.

Gases

624 Calibration Mix #1 (gases) (5 components)

bromomethane
chloroethane
chloromethane
trichlorofluoromethane (CFC-11)
vinyl chloride

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30020 (ea.)

tech tip

Achieving the Best Results From Gas Standards

In order to achieve the best results from gas standards, proper handling and storage of gas solutions is of vital importance. Use the following tips to help ensure trouble-free performance:

- Before opening the sealed ampul, warm it to room temperature and invert ampul several times. This will redissolve any gases that may have migrated into the headspace of the ampul.
- When diluting a gas standard, always add it to a solvent. Adding the gas standard to an empty vessel prior to adding solvent will result in the loss of gas compounds.
- When diluting a gas standard in solvent, make sure the pipette or needle tip is directly above, or immersed below, the solvent surface.
- We recommend that any unused portion of gas standard be disposed of after it has been removed from the sealed ampul. If it is necessary to store the unused portion, place it into a tightly capped vial and store it in the freezer.
- We recommend that any gas solutions that have been stored outside of a sealed ampul be disposed of after seven days.

Method 8240 (Volatile Organic Compounds [VOCs])

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

BTEX Gas Mix (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.) NEW!

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.) NEW!

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas
@ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

For more gas calibration standards,

See **pages 418–423.**

Japan Calibration Mix (9 components)

acrylonitrile
benzene
1,3-butadiene
chloroform
1,2-dichloroethane
dichloromethane
tetrachloroethylene
trichloroethylene
vinyl chloride

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34418 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26367 (ea.) NEW!

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34418-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Gasoline

Gasoline Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-bromofluorobenzene	460-00-4	PTM	2,500	30067
4-bromofluorobenzene	460-00-4	PTM	10,000	30082
1-chlorooctane	111-85-3	PTM	10,000	30084
α,α,α-trifluorotoluene	98-08-8	PTM	2,500	30068
α,α,α-trifluorotoluene	98-08-8	PTM	10,000	30083

Recommended Internal Standard (PID) for EPA GRO Method

Compound	CAS #	Solvent	Conc.	cat.#
1-chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066

PTM = Purge-and-trap grade methanol

Unleaded Gasoline Standard

Prepared from a single-source (one-refinery) product.

unleaded gasoline: unweathered

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30096 (ea.)

Unleaded Gasoline Composite Standard

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul
cat.# 30206 (ea.)

Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX)

PVOC Mix (California) (7 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30231 (ea.)

PVOC/GRO Mix (Wisconsin) (10 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30095 (ea.)

GRO Mix (9 components)

benzene
ethylbenzene
3-methylpentane
naphthalene
toluene
1,2,4-trimethylbenzene
2,2,4-trimethylpentane (isooctane)
m-xylene
o-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30069 (ea.)

Petroleum Volatile Organic Compounds (PVOC), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX), *cont.*

GRO Mix (EPA) (9 components)

benzene	500 µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500		

In P&T methanol, 1 mL/ampul
cat.# 30065 (ea.)

BTEX Standard (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

Gasoline Component Standard (10 components)

benzene	500 µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500	*p*-xylene	1,000

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

Certified BTEX in Unleaded Gas Composite Standard (9 components)

Certified for:
benzene*
ethylbenzene*
isopropyl benzene*
methyl *tert*-butyl ether (MTBE)*
naphthalene*
toluene*
m-xylene*
o-xylene*
p-xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30237 (ea.)

*Concentration differs from lot to lot. See online certificate of analysis for certified concentrations.

Certified Aromatics in Gasoline (16 components)

Certified for:
benzene*
ethylbenzene*
m-ethyltoluene*
o-ethyltoluene*
p-ethyltoluene*
isopropylbenzene*
methyl *tert*-butyl ether (MTBE)*
naphthalene*
n-propylbenzene*
toluene*
1,2,3-trimethylbenzene*
1,2,4-trimethylbenzene*
1,3,5-trimethylbenzene*
m-xylene*
o-xylene*
p-xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30485 (ea.)

*Concentration differs from lot to lot. See online certificate of analysis for certified concentrations.

Glycols

Glycols Standard (2 components)

ethylene glycol
propylene glycol

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

Haloacetic Acids

Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon)

Internal Standards and Surrogates for Method 552

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
Internal Standard				
1,2,3-trichloropropane	96-18-4	MTBE	1,000	31648
Surrogates for Method 552, 552.1				
2,3-dichloropropionic acid	565-64-0	MTBE	1,000	31650
3,5-dichlorobenzoic acid	51-36-5	MTBE	1,000	31652
3,5-dichlorobenzoic acid methyl ester	2905-67-1	MTBE	1,000	31649
2,3-dichloropropionic acid methyl ester	3674-09-7	MTBE	1,000	31651
Surrogates for Method 552.2				
2-bromopropionic acid	598-72-1	MTBE	1,000	31653
2,3-dibromopropionic acid	600-05-5	MTBE	1,000	31655
methyl-2,3-dibromopropionate	1729-67-5	MTBE	1,000	31656
Surrogates for Method 552.3				
2-bromobutanoic acid	80-58-0	MTBE	2,000	31881
2-bromobutyrate	3196-15-4	MTBE	2,000	31882

MTBE = methyl *tert*-butyl ether

Haloacetic Acid Mix (9 components)

bromochloroacetic acid
bromodichloroacetic acid
chlorodibromoacetic acid
dibromoacetic acid
dichloroacetic acid
monobromoacetic acid
monochloroacetic acid
tribromoacetic acid
trichloroacetic acid

1,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31896 (ea.)

Haloacetic Acid Mix #1 (6 components)

bromochloroacetic acid
dibromoacetic acid
dichloroacetic acid
monobromoacetic acid
monochloroacetic acid
trichloroacetic acid

2,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31644 (ea.)

Haloacetic Acids, *cont.*

Methods 552, 552.1, 552.2, 552.3 (Haloacetic Acids and Dalapon), *cont.*

Haloacetic Acid Methyl Ester Mix #1 (6 components)

methyl bromochloroacetate
methyl dibromoacetate
methyl dichloroacetate
methyl monobromoacetate
methyl monochloroacetate
methyl trichloroacetate

1,000 µg/mL each in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31645 (ea.)

Haloacetic Acid Mix #2 (9 components)

bromochloroacetic acid	400 µg/mL	monobromoacetic acid	400
bromodichloroacetic acid	400	monochloroacetic acid	600
chlorodibromoacetic acid	1,000	tribromoacetic acid	2,000
dibromoacetic acid	200	trichloroacetic acid	200
dichloroacetic acid	600		

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31646 (ea.)

Haloacetic Acid Methyl Ester Mix #2 (9 components)

methyl bromochloroacetate	400 µg/mL	methyl monobromoacetate	400
methyl bromodichloroacetate	400	methyl monochloroacetate	600
methyl chlorodibromoacetate	1,000	methyl tribromoacetate	2,000
methyl dibromoacetate	200	methyl trichloroacetate	200
methyl dichloroacetate	600		

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31647 (ea.)

Dalapon (2,2-dichloropropionic acid)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Dalapon Methyl Ester

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32254 (ea.)

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 32057 (ea.)

Haloethers

611 Haloethers Calibration Mix (5 components)

bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
4-bromophenyl phenyl ether
4-chlorophenyl phenyl ether

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31034 (ea.)

Herbicides, Chloroacetanilide Herbicide Degradates

Method 535 (Chloroacetanilide Herbicide Degradates)

Method 535 Internal Standard

butachlor ESA sodium salt

100 µg/mL in methanol, 1 mL/ampul
cat.# 33202 (ea.)

Method 535 Surrogate Standard

dimethachlor ESA sodium salt

100 µg/mL in methanol, 1 mL/ampul
cat.# 33203 (ea.)

Method 535 Individual Compounds

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
acetochlor ESA sodium salt	187022-11-3	M	100	33092
acetochlor OA	184992-44-4	M	100	33094
alachlor ESA sodium salt	142363-53-9	M	100	33096
alachlor OA	171262-17-2	M	100	33099
metolachlor ESA sodium salt	171118-09-5	M	100	33200
metolachlor OA	152019-73-3	M	100	33201

M = methanol

Herbicides, Chlorinated Acid

Method 515, 515.4 (Chlorinated Acid Herbicides)

Herbicide Internal Standard

4,4'-dibromooctafluorobiphenyl

250 µg/mL in hexane, 1 mL/ampul
cat.# 32053 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31040 (ea.)

2,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31856 (ea.)

Herbicide Surrogate

Free Acid Form

2,4-dichlorophenylacetic acid (2,4-DCAA)

200 µg/mL in methanol, 1 mL/ampul
cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32439 (ea.)

Derivatized Form

2,4-dichlorophenyl acetic acid methyl ester (DCAA methyl ester)

200 µg/mL in hexane, 1 mL/ampul
cat.# 32050 (ea.)

Method 515, 515.4 (Chlorinated Acid Herbicides), *cont.*

Herbicide Lab Performance Check Mix (5 components)

dinoseb methyl ether	4 µg/mL	3,5-dichlorobenzoic acid methyl ester	600
DCAA methyl ester	500	4-nitroanisole	1,600
4,4'-dibromooctafluorobiphenyl	250		

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32063 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form

2,4-D
2,4-DB
2,4,5-T
2,4,5-TP
dicamba
dichlorprop
dinoseb

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32054 (ea.)

Derivatized Form

2,4-D methyl ester
2,4-DB methyl ester
2,4,5-T methyl ester
2,4,5-TP methyl ester
dicamba methyl ester
dichlorprop methyl ester
dinoseb methyl ether

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32055 (ea.)

Herbicide Mix #2

Free Acid Form

dalapon

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Derivatized Form

dalapon methyl ester

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 32057 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32254 (ea.)

Herbicide Mix #4 (8 components)

Free Acid Form

acifluorfen
bentazon
chloramben
DCPA diacid
3,5-dichlorobenzoic acid
4-nitrophenol
pentachlorophenol
picloram

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32061 (ea.)

Derivatized Form

acifluorfen methyl ester
bentazon methyl ester
chloramben methyl ester
DCPA (Dacthal)
3,5-dichlorobenzoic acid methyl ester
4-nitroanisole
pentachloroanisole
picloram methyl ester

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32062 (ea.)

Herbicides, Chlorinated Acid, *cont.*

Method 515, 515.4 (Chlorinated Acid Herbicides), *cont.*

515.4 Calibration Mix (16 components)

acifluorfen (Blazer)	50 µg/mL	3,5-dichlorobenzoic acid	50
bentazon	100	dichlorprop	100
chloramben	50	dinoseb	100
2,4-D	100	pentachlorophenol	10
dalapon	100	picloram	50
2,4-DB	100	quinclorac	50
DCPA diacid (tetrachloroterephthalic acid)	50	2,4,5-T	25
dicamba	50	2,4,5-TP (Silvex)	25

In acetone, 1 mL/ampul

cat.# 32443 (ea.)

515.4 Methylated Chlorinated Acids Mix

(16 components)

acifluorfen methyl ester	50 µg/mL	3,5-dichlorobenzoic acid methyl ester	50
bentazon methyl ester	100	dichlorprop methyl ester	100
chloramben methyl ester	50	dinoseb methyl ether	100
dalapon methyl ester	100	pentachloroanisole	10
2,4-D methyl ester	100	picloram methyl ester	50
2,4-DB methyl ester	100	quinclorac methyl ester	50
DCPA (Dacthal)	100	2,4,5-T methyl ester	25
dicamba methyl ester	50	2,4,5-TP (Silvex) methyl ester	25

In methyl *tert*-butyl ether, 1 mL/ampul

cat.# 32444 (ea.)

Method 555 (Chlorinated Acids) LC Mixes

Chlorinated Acids by LC, Mix A (8 components)

acifluorfen (Blazer)	dicamba
bentazon	dichlorprop
chloramben	picloram
2,4-D	2,4,5-TP (Silvex)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 32431 (ea.)

Chlorinated Acids by LC, Mix B (8 components)

2,4-DB	MCPP (mecoprop)
3,5-dichlorobenzoic acid	4-nitrophenol
dinoseb	pentachlorophenol
MCPA	2,4,5-T

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 32430 (ea.)

Chlorinated Acid Herbicide Mix (2 components)

2,4-dichlorophenoxyacetic acid (2,4-D)
2,4,5-TP (Silvex)

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 32429 (ea.)

Method 615 (Chlorinated Acid Herbicides)

Herbicide Surrogate

Free Acid Form

2,4-dichlorophenylacetic acid (2,4-DCAA)

200 µg/mL in methanol, 1 mL/ampul

cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32439 (ea.)

Derivatized Form

2,4-dichlorophenyl acetic acid methyl ester (DCAA methyl ester)

200 µg/mL in hexane, 1 mL/ampul

cat.# 32050 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form

2,4-D	dicamba
2,4-DB	dichlorprop
2,4,5-T	dinoseb
2,4,5-TP	

200 µg/mL each in methanol, 1 mL/ampul

cat.# 32054 (ea.)

Derivatized Form

2,4-D methyl ester	dicamba methyl ester
2,4-DB methyl ester	dichlorprop methyl ester
2,4,5-T methyl ester	dinoseb methyl ether
2,4,5-TP methyl ester	

200 µg/mL each in hexane, 1 mL/ampul

cat.# 32055 (ea.)

Herbicide Mix #2

Free Acid Form

dalapon

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul

cat.# 32056 (ea.)

Derivatized Form

dalapon methyl ester

2,000 µg/mL in hexane, 1 mL/ampul

cat.# 32057 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul

cat.# 32254 (ea.)

Herbicide Mix #3 (2 components)

Free Acid Form

MCPA
MCPP

20,000 µg/mL each in methanol, 1 mL/ampul

cat.# 32058 (ea.)

Derivatized Form

MCPA methyl ester
MCPP methyl ester

20,000 µg/mL each in hexane, 1 mL/ampul

cat.# 32059 (ea.)

Herbicides, Chlorinated Acid, *cont.*

Method 8150, 8151, 8151A (Chlorinated Acid Herbicides)

Herbicide Internal Standard

4,4'-dibromooctafluorobiphenyl

250 µg/mL in hexane, 1 mL/ampul
cat.# 32053 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31040 (ea.)

2,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31856 (ea.)

Herbicide Surrogate

Free Acid Form

2,4-dichlorophenylacetic acid (2,4-DCAA)

200 µg/mL in methanol, 1 mL/ampul
cat.# 32049 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32439 (ea.)

Derivatized Form

2,4-dichlorophenyl acetic acid methyl ester (DCAA methyl ester)

200 µg/mL in hexane, 1 mL/ampul
cat.# 32050 (ea.)

Herbicide Mix #1 (7 components)

Free Acid Form

2,4-D
2,4-DB
2,4,5-T
2,4,5-TP
dicamba
dichlorprop
dinoseb

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32054 (ea.)

Derivatized Form

2,4-D methyl ester
2,4-DB methyl ester
2,4,5-T methyl ester
2,4,5-TP methyl ester
dicamba methyl ester
dichlorprop methyl ester
dinoseb methyl ether

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32055 (ea.)

Herbicide Mix #2

Free Acid Form

dalapon

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Derivatized Form

dalapon methyl ester

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 32057 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32254 (ea.)

Herbicide Mix #3 (2 components)

Free Acid Form

MCPA
MCPP

20,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32058 (ea.)

Derivatized Form

MCPA methyl ester
MCPP methyl ester

20,000 µg/mL each in hexane, 1 mL/ampul
cat.# 32059 (ea.)

MCPA

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32269 (ea.)

MCPP

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32271 (ea.)

Herbicide Mix #4 (8 components)

Free Acid Form

acifluorfen
bentazon
chloramben
DCPA diacid
3,5-dichlorobenzoic acid
4-nitrophenol
pentachlorophenol
picloram

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32061 (ea.)

Derivatized Form

acifluorfen methyl ester
bentazon methyl ester
chloramben methyl ester
DCPA (Dacthal)
3,5-dichlorobenzoic acid methyl ester
4-nitroanisole
pentachloroanisole
picloram methyl ester

200 µg/mL each in hexane, 1 mL/ampul
cat.# 32062 (ea.)

Picloram

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32265 (ea.)

3,5-Dichlorobenzoic Acid Surrogate Standard

1,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31652 (ea.)

3,5-Dichlorobenzoic Acid Methyl Ester Surrogate Standard

1,000 µg/mL in methyl *tert*-butyl ether, 1 mL/ampul
cat.# 31649 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32264 (ea.)

Herbicides, Chlorinated Acid, *cont.*

Method 8321 (Chlorinated Acids by LC)

Chlorinated Acids by LC, Mix A (8 components)

acifluorfen (Blazer)
bentazon
chloramben
2,4-D
dicamba
dichlorprop
picloram
2,4,5-TP (Silvex)

1,000 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 32431 (ea.)

Chlorinated Acids by LC, Mix B (8 components)

2,4-DB
3,5-dichlorobenzoic acid
dinoseb
MCPA
MCPP (mecoprop)
4-nitrophenol
pentachlorophenol
2,4,5-T

1,000 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 32430 (ea.)

Chlorinated Acid Herbicide Mix (2 components)

2,4-dichlorophenoxyacetic acid (2,4-D)
2,4,5-TP (Silvex)

1,000 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 32429 (ea.)

Dalapon (2,2-dichloropropionic acid)

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 32432 (ea.)

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 32253 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32056 (ea.)

Herbicides, Phenoxyacid

Canadian Drinking Water Phenoxyacid Herbicides Mix (11 components)

bromoxynil
2,4-D
dicamba
2,4-dichlorophenol
diclofop methyl
dinoseb
pentachlorophenol
picloram
2,4,5-T
2,3,4,6-tetrachlorophenol
2,4,6-trichlorophenol

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31868 (ea.)

Method 1311 (Toxicity Characteristics Leaching Procedure [TCLP])

TCLP Herbicide Mix (2 components)

2,4-D (free acid)
Silvex (free acid)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32014 (ea.)

Herbicides, Glyphosate

Method 547 (Glyphosate)

Glyphosate Standard

1,000 µg/mL in DI water, 1 mL/ampul
cat.# 32426 (ea.)

1,000 µg/mL in DI water, 5 mL/ampul
cat.# 32427 (ea.)

AMPA (glyphosate metabolite)

aminomethyl phosphonic acid (AMPA)

100 µg/mL in DI water, 1 mL/ampul
cat.# 32428 (ea.)

Herbicides, Paraquat/Diquat

Method 549.2 (Paraquat/Diquat)

Paraquat & Diquat Calibration Mix (2 components)

diquat dibromide
paraquat dichloride

1,000 µg/mL each in water, 1 mL/ampul
cat.# 32437 (ea.)

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Herbicides, Triazines

Canadian Drinking Water Triazine Herbicides Mix

(7 components)

alachlor
atrazine
cyanazine (Bladex)
metolachlor
metribuzin
prometryne
simazine

500 µg/mL each in acetone, 1 mL/ampul

cat.# 31864 (ea.)

Desethyl-atrazine

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32445 (ea.)

Desisopropylatrazine

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32446 (ea.)

Terbuthylazine

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32447 (ea.)

Propazine

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32448 (ea.)

Prometryne

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32449 (ea.)

Hormones

Method 539 (Hormones in Drinking Water)

EPA 539 Calibration Stock Standard (7 components)

- Contains the seven hormones listed in EPA Method 539 at the appropriate concentrations.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also available: UCMR3 Method 539 calibration standard with concentrations of 10–400 µg/mL to more conveniently match UCMR3 requirements (cat.# 32461).

4-androstene-3,17-dione	CAS # 63-05-8	100 µg/mL
equilin	CAS # 474-86-2	200
17-beta-estradiol	CAS # 50-28-2	250
estriol	CAS # 50-27-1	200
estrone	CAS # 53-16-7	200
17-alpha-ethynylestradiol	CAS # 57-63-6	350
testosterone	CAS # 58-22-0	100

In acetonitrile, 1 mL/ampul

cat.# 31998 (ea.)

NEW!

UCMR3 Method 539 Calibration Standard

(7 components)

- Contains the seven hormones listed in EPA Method 539 at concentrations suited for Unregulated Contaminant Monitoring Rule 3 (UCMR3) screening.
- Ideal for the analysis of finished drinking water as outlined in UCMR3, which requires monitoring of all public drinking water systems with 10,000 or more customers.
- Certified reference material (CRM) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also available: EPA 539 calibration stock standard with concentrations of 100–350 µg/mL to more conveniently match EPA requirements (cat.# 31998).

4-androstene-3,17-dione	CAS # 63-05-8	30 µg/mL
equilin	CAS # 474-86-2	400
17-beta-estradiol	CAS # 50-28-2	40
estriol	CAS # 50-27-1	80
estrone	CAS # 53-16-7	200
17-alpha-ethynylestradiol	CAS # 57-63-6	90
testosterone	CAS # 58-22-0	10

In acetonitrile, 1 mL/ampul

cat.# 32461 (ea.)

NEW!

Hydrocarbons, Aromatic

Method 602 (Purgeable Aromatics)

602 Purgeable Aromatics Calibration Mix

(7 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
toluene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30035 (ea.)

Method 8020 (Aromatic Volatile Organics)

Internal and Surrogate Standards for Method 8020

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-bromofluorobenzene	460-00-4	PTM	2,000	30026
1,4-difluorobenzene	540-36-3	PTM	2,000	30032
fluorobenzene	462-06-6	PTM	2,000	30030
α,α,α-trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

8020A Calibration Mix (10 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30222 (ea.)

Method 609 (Nitroaromatics/Isophorone)

609 Nitroaromatics & Isophorone Calibration Mix

(4 components)

2,4-dinitrotoluene
isophorone
2,6-dinitrotoluene
nitrobenzene

2,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31033 (ea.)

Hydrocarbons, Halogenated

Method 611 (Haloethers)

611 Haloethers Calibration Mix (5 components)

bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
4-bromophenyl phenyl ether
4-chlorophenyl phenyl ether

2,000 µg/mL each in acetone, 1 mL/ampul

cat.# 31034 (ea.)

Method 612 (Chlorinated Hydrocarbons)

612 Chlorinated Hydrocarbons Calibration Mix

(9 components)

2-chloronaphthalene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
1,2,4-trichlorobenzene

2,000 µg/mL each in isooctane, 1 mL/ampul

cat.# 31035 (ea.)

Method 624 (Purgeable Halocarbons)

Volatiles MegaMix® Standard, EPA Method 624 (26 components)

MEGAMIX®

benzene
bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30497 (ea.)

624 Internal Standard Mix (3 components)

bromochloromethane
2-bromo-1-chloropropane
1,4-dichlorobutane

1,500 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30023 (ea.)

624 Surrogate Standard Mix (3 components)

4-bromofluorobenzene
fluorobenzene
pentafluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30243 (ea.)

Hydrocarbons, Halogenated, *cont.*

Method 624 (Purgeable Halocarbons), *cont.*

Surrogate Standard (2 components)

4-bromofluorobenzene
α,α,α-trifluorotoluene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30484 (ea.)

624 Calibration Mix #1 (gases) (5 components)

bromomethane
chloroethane
chloromethane
trichlorofluoromethane (CFC-11)
vinyl chloride

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30020 (ea.)

624 Calibration Mix #2 (12 components)

benzene
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
dibromochloromethane
1,1-dichloroethane
1,1-dichloroethene
1,2-dichloropropane
methylene chloride
tetrachloroethene
1,1,2-trichloroethane
trichloroethene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30021 (ea.)

624 Calibration Mix #3 (14 components)

bromodichloromethane
bromoform
chloroform
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,2-dichloroethane
trans-1,2-dichloroethene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
1,1,2,2-tetrachloroethane
toluene
1,1,1-trichloroethane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30022 (ea.)

Method 8010 (Halogenated Volatile Organics)

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

8010A Calibration Mix #2 (15 components)

benzyl chloride
bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,1-dichloroethene
trans-1,2-dichloroethene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
tetrachloroethene
trichloroethene
1,2,3-trichloropropane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30056 (ea.)

8010A Calibration Mix #3 (13 components)

bromobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
dibromomethane
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,2-dichloropropane
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
1,1,1-trichloroethane
1,1,2-trichloroethane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30057 (ea.)

Note: Method 8010 does not specify internal standards to be used. The analyst must select appropriate internal standards based on the particular samples being analyzed. Potential internal standards are available. See pages 440–445.

BTEX Standard (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

Method 8011 (1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane)

8011 Calibration Mix—EDB/DBCP (2 components)

1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30062 (ea.)

Hydrocarbons, Polycyclic Aromatic (PAHs)

Method 610
(Polycyclic Aromatic Hydrocarbons [PAHs])

SV Calibration Mix #5 / 610 PAH Mix (16 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31011 (ea.)

610 PAH Calibration Mix A (16 components)

For LC-fluorescence detection.

acenaphthene	1,000 µg/mL	chrysene	500
acenaphthylene	1,000	dibenzo(a,h)anthracene	500
anthracene	1,000	fluoranthene	500
benzo(a)anthracene	500	fluorene	1,000
benzo(a)pyrene	500	indeno(1,2,3-cd)pyrene	500
benzo(b)fluoranthene	500	naphthalene	1,000
benzo(k)fluoranthene	500	phenanthrene	500
benzo(ghi)perylene	500	pyrene	500

In methylene chloride, 1 mL/ampul
cat.# 31264 (ea.)

610 PAH Calibration Mix B (16 components)

For LC-UV detection.

acenaphthene	1,000 µg/mL	chrysene	100
acenaphthylene	2,000	dibenzo(a,h)anthracene	200
anthracene	100	fluoranthene	200
benzo(a)anthracene	100	fluorene	200
benzo(a)pyrene	100	indeno(1,2,3-cd)pyrene	100
benzo(b)fluoranthene	200	naphthalene	1,000
benzo(k)fluoranthene	100	phenanthrene	100
benzo(ghi)perylene	200	pyrene	100

In methylene chloride:methanol (1:1), 1 mL/ampul
cat.# 31455 (ea.)

Method 8100
(Polycyclic Aromatic Hydrocarbons [PAHs])

PAH Supplement Mix for Method 8100 (8 components)

benzo(j)fluoranthene
dibenzo(a,h)acridine
dibenzo(a,j)acridine
7H-dibenzo(c,g)carbazole
dibenzo(a,e)pyrene
dibenzo(a,h)pyrene
dibenzo(a,i)pyrene
3-methylcholanthrene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31857 (ea.)

SV Calibration Mix #5 / 610 PAH Mix (16 components)

See cat.# 31011 (above).

Method 8310
(Polycyclic Aromatic Hydrocarbons [PAHs])

EPA Method 8310 PAH Mixture (18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
1-methylnaphthalene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

500 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31841 (ea.)

EPA Method 8310 Surrogate Standard

decafluorobiphenyl

1,000 µg/mL in acetonitrile, 1 mL/ampul
cat.# 31842 (ea.)

EPA Method 8310 Quality Control Check

(18 components)

acenaphthene	100 µg/mL	dibenzo(a,h)anthracene	10
acenaphthylene	100	fluoranthene	10
anthracene	100	fluorene	100
benzo(a)anthracene	10	indeno(1,2,3-cd)pyrene	10
benzo(a)pyrene	10	1-methylnaphthalene	100
benzo(b)fluoranthene	10	2-methylnaphthalene	100
benzo(ghi)perylene	10	naphthalene	100
benzo(k)fluoranthene	5	phenanthrene	100
chrysene	10	pyrene	10

In acetonitrile, 1 mL/ampul
cat.# 31843 (ea.)

8270 Calibration Mix #5, Revised (18 components)

acenaphthene
acenaphthylene
anthracene
benz(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
1-methylnaphthalene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

NEW!

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31995 (ea.)

Certified PAHs in Diesel (7 components)

acenaphthene*
acenaphthylene*
fluorene*
1-methylnaphthalene*
2-methylnaphthalene*
naphthalene*
phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul
cat.# 31673 (ea.)

*Concentration differs from lot to lot. See online certificate of analysis for certified concentrations.

Hydrocarbons, Polycyclic Aromatic (PAHs), *cont.*

Miscellaneous

MA EPH Aromatic Hydrocarbon Standard
(17 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31458 (ea.)

MA Fractionation Surrogate Spike Mix (2 components)

2-bromonaphthalene
2-fluorobiphenyl

4,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31480 (ea.)

MA Fractionation Check Mix (31 components)

PAHs:
acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

Hydrocarbons:
n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-hexatriacontane (C36)

25 µg/mL each in hexane, 1 mL/ampul
cat.# 31481 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Fractionation Check Mix (16 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
phenanthrene
pyrene
1,2,3-trimethylbenzene

400 µg/mL each in hexane:toluene (50:50), 5 mL/ampul
cat.# 30545 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Matrix Spike Mix
(18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene
1,2,3-trimethylbenzene

200 µg/mL each in acetone:toluene (50:50), 5 mL/ampul
cat.# 30543 (ea.)

WA EPH Aromatic Hydrocarbon Standard
(18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene
1,2,3-trimethylbenzene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31469 (ea.)

WA EPH Aromatic Hydrocarbon Mix (6 components)

acenaphthene
benzo(ghi)perylene
naphthalene
pyrene
toluene
1,2,3-trimethylbenzene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31488 (ea.)

Naphthalene-d8

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31043 (ea.)

Method 525.2 Fortification Recovery Standard

p-terphenyl-d14

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31828 (ea.)

Hydrocarbons, Polycyclic Aromatic (PAHs), *cont.*

Miscellaneous, *cont.*

SV Internal Standard Mix (6 components)

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
naphthalene-d8
perylene-d12
phenanthrene-d10

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

Revised SV Internal Standard Mix (7 components)

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
1,4-dioxane-d8
naphthalene-d8
perylene-d12
phenanthrene-d10

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31886	31886.15	31886.25

B/N Surrogate Mix (4/89 SOW) (3 components)

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31062	31062.15	31062.25
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31086	31086.15	31086.25
5,000 µg/mL each in methylene chloride, 10 mL/ampul		
33028	33028.15	33028.25

Revised B/N Surrogate Mix (4 components)

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14
pyrene-d10

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31887	31887.15	31887.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31888	31888.15	31888.25
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31889	31889.15	31889.25

Hydrocarbons, Petroleum

Fuels & Products

Aviation Gas

Aviation Gas Standard

100-octane, low-lead fuel used in piston-type aircraft.

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30094 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30207 (ea.)

Hydrocarbons, Petroleum, *cont.*

Fuels & Products, *cont.*

BTEX

See page 458.

Creosote Oil

Creosote Oil Standard

- For total petroleum hydrocarbon pattern recognition of creosote oil.
- High concentration—50,000 µg/mL in methylene chloride.

Creosote oil, a widely used wood preservative produced by distilling coal tar, contains chemicals that are classified as carcinogens (e.g., benzo(a)pyrene).

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31838 (ea.)

Diesel

See pages 458–459.

Fuel Oil

Fuel Oil #4 Standard

Fuel oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (fuel oil #2) and residual (fuel oil #6) to meet ASTM viscosity specifications. The fuel oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38 °C (100 °F), measured using ASTM D-445.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31216 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31244 (ea.)

Fuel Oil #5 Standard

Fuel oil #5 is typically used in applications in which there is little or no preheating of the fuel prior to burning. A blend of distillate (fuel oil #2) and residual (fuel oil #6), the fuel oil #5 used to prepare this mixture has a kinematic viscosity of 106.5 at 38 °C (100 °F), measured using ASTM D-445.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31217 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31246 (ea.)

Hydrocarbons, Petroleum, *cont.*

Fuels & Products, *cont.*

Fuel Oil, *cont.*

Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31248 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31249 (ea.)

Fuel Oil Degradation Mix (4 components)

Subsurface degradation of fuel oil spills can be estimated by examining the ratios of C17/pristane and C18/phytane.[1] To assist in identifying these four compounds from the complex fuel oil analysis, we offer a product that contains these compounds for retention time determination.

heptadecane (C17)
octadecane (C18)
pristane (2,6,10,14-tetramethylpentadecane)
phytane (2,6,10,14-tetramethylhexadecane)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31240 (ea.)

[1]Interpretation of Gas Chromatographic Data in Subsurface Hydrocarbon Investigations, R. Senn and M. Johnson, Ground Water Monitoring Review, Winter 1987.

Gasoline

See page 464.

Hydraulic Oil

Hydraulic Oil Standard

- For total petroleum hydrocarbon pattern recognition of hydraulic oil.
- High concentration—50,000 µg/mL in methylene chloride.

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31839 (ea.)

Jet Fuel

JP-4 Military Fuel Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31219 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31250 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30472 (ea.)

JP-5 Military Fuel Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31220 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31252 (ea.)

JP-8 Military Fuel Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31262 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31254 (ea.)

Jet Fuel A Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31215 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31242 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31243 (ea.)

Kerosene

Kerosene Standard

Prepared from a single-source (one-refinery) product.

kerosene: unweathered

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31229 (ea.)

Kerosene Composite Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31257 (ea.)

Leaking Underground Storage Tank (LUST)

See pages 555–567.

Hydrocarbons, Petroleum, *cont.*

Fuels & Products, *cont.*

Mineral Spirits

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

We prepare our solutions from an equal-volume blend of Type I, II, and III mineral spirits.

Mineral Spirits Standards (Unweathered)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31225 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31260 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31261 (ea.)

Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30487 (ea.)

Motor Oil

Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31464 (ea.)

Used Motor Oil Composite Standard

Prepared from an equal-volume blend from five gasoline-powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31465 (ea.)

Stoddard Solvent

See cat.# 30487 (left).

Hydrocarbons, Petroleum, *cont.*

Retention Time Markers

Used during initial sample screening to determine retention time windows for each petroleum product. Gasoline generally elutes in the window from C6 to C10 (or C12), and diesel fuel from C10 (or C12) to C24 (or C28). Retention above C24 (or C28) indicates oil or lubricant contamination.

Leaking Underground Storage Tank Retention Time Standard (7 components)

n-hexane (C6)
n-decane (C10)
n-dodecane (C12)
n-tetracosane (C24)
n-octacosane (C28)
n-triacontane (C30)
n-tetracontane (C40)

25 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31200 (ea.)

Retention Time Marker Standard (3 components)

n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31637 (ea.)

Retention Time Marker (3 components)

n-hexane (C6)
n-decane (C10)
n-dodecane (C12)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30483 (ea.)

TNRCC 1005 Retention Time Markers Mix (4 components)

n-hexane (C6)
n-dodecane (C12)
n-octacosane (C28)
n-pentatriacontane (C35)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31698 (ea.)

TNRCC 1006 Retention Time Marker Mix (9 components)

n-hexane (C6)
n-heptane (C7)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-octacosane (C28)
n-pentatriacontane (C35)

200 µg/mL in pentane, 1 mL/ampul
cat.# 31814 (ea.)

Retention Time Marker - Alaska (4 components)

n-hexane (C6)
n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31819 (ea.)

Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard (9 components)

n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-octacosane (C28)
n-pentatriacontane (C35)
n-hexatriacontane (C36)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31639 (ea.)

CCME F1 Retention Time Marker (3 components)

n-decane (C10)
n-hexane (C6)
toluene

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 30611 (ea.)

Hydrocarbons, Petroleum, *cont.*

Total Petroleum Hydrocarbons (TPH)

Method 418.1 (Total Recoverable Petroleum Hydrocarbons [TRPH])

418.1 Calibration Mix (3 components)

Method 418.1 is an infrared spectrophotometric method for determining Total Recoverable Petroleum Hydrocarbons (TRPH). Dilute this mixture 1:200 to make the stock mixture specified in section 6.5.2 of Method 418.1.

chlorobenzene	25.0% (v/v)
n-hexadecane	37.5%
isooctane	37.5%

1 mL/ampul

cat.# 30080 (ea.)

Miscellaneous

Glycols Standard (2 components)

ethylene glycol
propylene glycol

50,000 µg/mL each in DI water, 1 mL/ampul

cat.# 30471 (ea.)

NW TPH-Dx Surrogate Mix Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-fluorobiphenyl	321-60-8	D	10,000	31096
o-terphenyl	84-15-1	D	10,000	31097
p-terphenyl	92-94-4	D	10,000	31095
pentacosane (C25)	629-99-2	D	10,000	31487

D = methylene choride

TX TPH Locator Mix (3 components)

n-hexane (C6)
n-decane (C10)
n-octacosane (C28)

200 µg/mL each in pentane, 1 mL/ampul

cat.# 31482 (ea.)

TX TPH Calibration Mix (2 components)

diesel fuel #2 composite
unleaded gasoline composite

10,000 µg/mL each in pentane, 1 mL/ampul

cat.# 31483 (ea.)

TX TPH Matrix Spike Mix (2 components)

diesel fuel #2 composite
unleaded gasoline composite

10,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 31484 (ea.)

Miscellaneous, *cont.*

CCME PHC Calibration Mix (3 components)

- Meets CCME 2001 Petroleum Hydrocarbons in Soil Method—Tier 1.
- Primary reference calibration standards for quantification of four fractions.

n-decane (C10)
n-hexadecane (C16)
n-tetratriacontane (C34)

5,000 µg/mL each in toluene, 1 mL/ampul

cat.# 31684 (ea.)

α,α,α-Trifluorotoluene

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30083 (ea.)

1-Chlorooctane

10,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30084 (ea.)

1-Chlorooctadecane

10,000 µg/mL in methylene chloride, 1 mL/ampul

cat.# 31098 (ea.)

Weathered Petrochemical Solutions

See pages 454–455.

Isocyanates

ASTM Method D5836-03/OSHA 42, OSHA 47, NIOSH 5522 (Analysis of Isocyanates in Indoor Air by LC)

ASTM D5836 and OSHA 42 are test methods for determining 2,4-toluene diisocyanate (2,4-TDI) and 2,6-TDI in the workplace atmosphere. OSHA 47 is for 4,4'-methylenediphenyl isocyanate (4,4'-MDI) in indoor air, and NIOSH Method 5522 is for 2,4-TDI; 2,6-TDI; 4,4'-MDI; and 1,6-hexamethylene diisocyanate (1,6-HDI) in air. Restek offers the 1,-(2-pyridyl)piperzine (1-2pp) derivative.

Isocyanates Singles

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2,6-TDIP	195625-39-9	DMSO	1,000	33000
2,4-TDIP	72375-21-4	DMSO	1,000	33001
1,6-HDIP	72375-27-0	DMSO	1,000	33002
4,4'-MDIP	72375-24-7	DMSO	1,000	33003

DMSO = dimethyl sulfoxide

Formaldehyde Oxazoladine

2,000 µg/mL in toluene, 1 mL/ampul
cat.# 33004 (ea.)

Jet Fuel

See page 476.

Kerosene

See page 476.

Ketones

VOA Calibration Mix #1 (ketones) (4 components)

acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30006 (ea.)

Ketones Mix, 524.2 Rev. 4.1 (5 components)

acetone
2-butanone (MEK)
1,1-dichloro-2-propanone
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30602 (ea.)

Ketones, *cont.*

Aldehyde-Ketone-DNPH TO-11A Calibration Mix (15 components)

acetaldehyde-DNPH
acetone-DNPH
acrolein-DNPH
benzaldehyde-DNPH
n-butyraldehyde-DNPH
crotonaldehyde-DNPH
2,5-dimethylbenzaldehyde-DNPH
formaldehyde-DNPH
hexaldehyde-DNPH
isovaleraldehyde-DNPH
propionaldehyde-DNPH
m-tolualdehyde-DNPH
o-tolualdehyde-DNPH
p-tolualdehyde-DNPH
valeraldehyde-DNPH

15 µg/mL each in acetonitrile, 1 mL/ampul*
cat.# 31808 (ea.)

*Concentration calculated as the aldehyde/ketone.

Leaking Underground Storage Tank (LUST)

See pages 555–567.

Nitriles

8240 Nitriles Mix (7 components)

acrylonitrile
ethyl methacrylate
malononitrile
methacrylonitrile
methyl methacrylate
propionitrile
styrene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30215 (ea.)

Method 603 (Acrolein/Acrylonitrile)

Acrolein/Acrylonitrile (2 components)

acrolein
acrylonitrile

2,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30600 (ea.)

Must ship overnight on ice.
This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrolein

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrylonitrile

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30246 (ea.)

Nitroaromatics & Nitramines

See pages 461 and 462.

Nitrosamines

Method 521 (Nitrosamines)

Nitrosamine Calibration Mix, Method 521

(7 components)

N-nitrosodiethylamine
N-nitrosodimethylamine
N-nitrosodi-*n*-butylamine
N-nitrosodi-*n*-propylamine
N-nitrosomethylethylamine
N-nitrosopiperidine
N-nitrosopyrrolidine

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31898 (ea.)

N-Nitrosodimethylamine-d6

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 33910 (ea.)

N-Nitrosodi-*n*-propylamine-d14

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 33911 (ea.)

Method 522 (1,4-Dioxane)

Tetrahydrofuran-d8 Standard

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30112 (ea.)

1,4-Dioxane-d8

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30614 (ea.)

1,4-Dioxane

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30287 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31853 (ea.)

1.9 mg/mL in dimethyl sulfoxide, 1 mL/ampul
cat.# 36294 (ea.)

Method 607 (Nitrosamines)

607 Nitrosamines Calibration Mix (3 components)

N-nitrosodimethylamine
N-nitroso-di-*n*-propylamine
N-nitrosodiphenylamine

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31032 (ea.)

Oil & Grease

Method 1664 (Oil & Grease)

Method 1664 Oil & Grease Standard (2 components)

n-hexadecane (C16)
stearic acid

2,000 µg/mL each in acetone, 10 mL/ampul
cat.# 31954 (ea.)

NEW!

Method 1664 Oil & Grease Mix (2 components)

n-hexadecane (C16)
stearic acid

4,000 µg/mL each in acetone, 5 mL/ampul
cat.# 31457 (ea.)

Organometallics/Organotin

Complete data pack available for audit compliance.

Butyltin Chloride Calibration Mixture (4 components)

butyltin trichloride
dibutyltin dichloride
tetrabutyltin
tributyltin chloride

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31472 (ea.)

Tributyltin Chloride Calibration Mixture

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31478 (ea.)

Phenyltin Chloride Calibration Mixture (4 components)

diphenyltin dichloride
phenyltin trichloride
tetraphenyltin
triphenyltin chloride

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31473 (ea.)

Tri-*n*-propyltin Chloride Surrogate

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31476 (ea.)

Tripentyltin Chloride Surrogate

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31477 (ea.)

Tetra-*n*-propyltin Internal Standard

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31474 (ea.)

Tetrapentyltin Internal Standard

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31475 (ea.)

Oxygenates/Ethers

California Oxygenates Mix (5 components)

diisopropyl ether (DIPE)	2,000 µg/mL	*tert*-butyl alcohol	10,000
ethyl-*tert*-butyl ether (ETBE)	2,000	methyl *tert*-butyl ether (MTBE)	2,000
tert-amyl methyl ether (TAME)	2,000		

In P&T methanol, 1 mL/ampul
cat.# 30465 (ea.)

Oxygenates (6 components)

tert-amyl ethyl ether (TAEE)	2,000 µg/mL	diisopropyl ether (DIPE)	2,000
tert-amyl methyl ether (TAME)	2,000	ethyl-*tert*-butyl ether (ETBE)	2,000
tert-butyl alcohol (TBA)	10,000	methyl *tert*-butyl ether (MTBE)	2,000

In P&T methanol, 1 mL/ampul
cat.# 30626 (ea.)

Single-Component Oxygenates Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
tert-amyl alcohol	75-85-4	PTM	10,000	30631
tert-amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617
tert-amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
tert-butanol	75-65-0	PTM	50,000	30470
tert-butanol-d9	25725-11-5	PTM	20,000	30618
diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
ethanol	64-17-5	PTM	2,000	30288
ethanol	64-17-5	W	10,000	30466
ethyl-*tert*-butyl ether (ETBE)	637-92-3	PTM	2,000	30628
methanol	67-56-1	W	10,000	30467
methyl *tert*-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402

PTM = purge-and-trap grade methanol; W = DI water

Pesticides, Carbamate

Method 531.1, 531.2 (Carbamates)

531.1 Internal Standard

4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC)

100 µg/mL in methanol, 1 mL/ampul

cat.# 32274 (ea.)

531.1 Performance Check Mix (4 components)

aldicarb sulfoxide	100 µg/mL	3-hydroxycarbofuran	2
BDMC	10	methiocarb	20

In methanol, 1 mL/ampul

cat.# 32275 (ea.)

531.1 Carbamate Pesticide Calibration Mixture

(10 components)

aldicarb
aldicarb sulfone
aldicarb sulfoxide
carbaryl (Sevin)
carbofuran
3-hydroxycarbofuran
methiocarb
methomyl
oxamyl
propoxur (Baygon)

100 µg/mL each in methanol, 1 mL/ampul

cat.# 32273 (ea.)

531.2 Carbamate Pesticide Calibration Mixture

(11 components)

- Complete set of materials for N-methylcarbamoyloximes and N-methylcarbamates.
- New mix satisfies latest update of EPA Method 531.2.
- Formulated in acetonitrile for stability and convenience for LC analysis.

aldicarb
aldicarb sulfone
aldicarb sulfoxide
carbaryl (Sevin)
carbofuran
3-hydroxycarbofuran
methiocarb
methomyl
1-naphthol
oxamyl
propoxur (Baygon)

100 µg/mL in acetonitrile, 1 mL/ampul

cat.# 32435 (ea.)

Canada

Canadian Drinking Water Carbamates Mix

(5 components)

aldicarb
bendiocarb
carbaryl (Sevin)
carbofuran
triallate

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31865 (ea.)

Pesticides, Chlorinated Disinfection By-Products, Pesticides & Herbicides

Method 551 (Chlorinated Disinfection By-Products, Pesticides & Herbicides)

551.1 Internal Standard

1-bromo-4-fluorobenzene

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 31854 (ea.)

551.1 Surrogate Standard

decafluorobiphenyl

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 31855 (ea.)

Method 551.1 Pesticide/Herbicide Mix (16 components)

alachlor
atrazine
bromacil
cyanazine (Bladex)
endrin
endrin aldehyde
endrin ketone
γ-BHC (lindane)
heptachlor
heptachlor epoxide (isomer B)
hexachlorobenzene
hexachlorocyclopentadiene
methoxychlor
metolachlor
simazine
trifluralin

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 32438 (ea.)

Chloral Hydrate

1,000 µg/mL in acetonitrile, 1 mL/ampul

cat.# 30609 (ea.)

Disinfection By-Product and Chlorinated Solvents Mix

(19 components)

bromochloroacetonitrile
bromodichloromethane
bromoform
carbon tetrachloride
chloroform
chloropicrin
dibromoacetonitrile
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dichloroacetonitrile
1,1-dichloro-2-propanone
tetrachloroethylene
trichloroacetonitrile
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethylene
1,2,3-trichloropropane
1,1,1-trichloro-2-propanone

2,000 µg/mL each in acetone, 1 mL/ampul

cat.# 30615 (ea.)

Disinfection By-Product Mix (7 components)

bromochloroacetonitrile
chloropicrin
dibromoacetonitrile
dichloroacetonitrile
1,1-dichloro-2-propanone
trichloroacetonitrile
1,1,1-trichloro-2-propanone

2,000 µg/mL each in acetone, 1 mL/ampul

cat.# 30616 (ea.)

Pesticides, Chlorinated/Organochlorine/Organohalide

Method 508 (Chlorinated Pesticides)

508.1 Internal Standard

pentachloronitrobenzene

100 µg/mL in ethyl acetate, 1 mL/ampul
cat.# 32091 (ea.)

508.1 Surrogate

4,4'-dibromobiphenyl

500 µg/mL in ethyl acetate, 1 mL/ampul
cat.# 32092 (ea.)

508.1 GC Degradation Check Mix (2 components)

4,4'-DDT
endrin

100 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32093 (ea.)

508 Performance Check Mix (4 components)

δ-BHC	0.4 µg/mL	chlorpyrifos	0.02
chlorothalonil	0.5	DCPA (Dacthal)	0.5

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32045 (ea.)

508.1 Calibration Mix #1 (17 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32094 (ea.)

508.1 Calibration Mix #2 (11 components)

chlorobenzilate
cis-chlordane
trans-chlordane
chlorneb
DCPA (Dacthal)
etridiazole
hexachlorobenzene
cis-permethrin*
trans-permethrin*
propachlor
trifluralin

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32095 (ea.)

*1,000 µg/mL total permethrin. Exact content of each isomer is listed on certificate of analysis.

508.1 Calibration Mix #3 (8 components)

alachlor
atrazine
chlorothalonil
cyanazine
hexachlorocyclopentadiene
metolachlor
metribuzin
simazine

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 32096 (ea.)

Toxaphene Solutions

toxaphene

1,000 µg/mL in hexane, 1 mL/ampul
cat.# 32005 (ea.)

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32015 (ea.)

5,000 µg/mL in isooctane, 1 mL/ampul
cat.# 32071 (ea.)

Organochlorine Pesticide System Evaluation Mix

(2 components)

- Designed for daily assessment of system performance.
- Reveals active sites in the injection port and/or GC column.
- Prepared in MTBE—low expansion volume helps minimize backflash.

4,4'-DDT	200 µg/mL
endrin	100 µg/mL

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32417 (ea.)

Decachlorobiphenyl, 508A

decachlorobiphenyl (BZ #209)

200 µg/mL in acetone, 1 mL/ampul
cat.# 32029 (ea.)

200 µg/mL in acetone, 5 mL/ampul
cat.# 32030 (ea.)

10 µg/mL in isooctane, 1 mL/ampul
cat.# 32289 (ea.)

508.1 Pesticide Kit

Contains 1 mL each of these mixtures.
32045: 508 Performance Check Mix
32091: 508.1 Internal Standard Mix
32092: 508.1 Surrogate Mix
32093: 508.1 GC Degradation Check Mix
32094: 508.1 Calibration Mix #1
32095: 508.1 Calibration Mix #2
32096: 508.1 Calibration Mix #3

cat.# 32097 (kit) kit

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

Method 508 (Chlorinated Pesticides), *cont.*

Endrin Standard

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32463 (ea.)

NEW!

Endrin Ketone Standard

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32464 (ea.)

NEW!

Endosulfan I Standard

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32465 (ea.)

NEW!

Endosulfan II Standard

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32466 (ea.)

NEW!

Endosulfan Sulfate Standard

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32467 (ea.)

NEW!

Endrin Aldehyde Standard

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32468 (ea.)

NEW!

Method 505 (Organohalide Pesticides & PCBs)

505 Organohalide Pesticide Mix (16 components)

aldrin
alachlor
atrazine
γ-BHC (lindane)
cis-chlordane
trans-chlordane
dieldrin
endrin
heptachlor
heptachlor epoxide (isomer B)
hexachlorobenzene
hexachlorocyclopentadiene
methoxychlor
cis-nonachlor
trans-nonachlor
simazine

200 µg/mL each in methanol, 1 mL/ampul
cat.# 32024 (ea.)

Toxaphene Solutions

See cat.#s 32005, 32015, and 32071 on page 484.

Method 608 (Organochlorine Pesticides & PCBs)

608 Calibration Mix (16 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
heptachlor
heptachlor epoxide (isomer B)

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32022 (ea.)

608 Complete Kit

Contains 1 mL each of these mixtures.
32022: 608 Calibration Mix
32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260
32005: toxaphene
32021: chlordane

cat.# 32060 (kit)

kit

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

Method 8080, 8081 (Chlorinated Pesticides)

Organochlorine Pesticide Mix AB #1 (20 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
cis-chlordane
trans-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32291 (ea.)

Organochlorine Pesticide Mix AB #2 (20 components)

aldrin	8 µg/mL	dieldrin	16
α-BHC	8	endosulfan I	8
β-BHC	8	endosulfan II	16
δ-BHC	8	endosulfan sulfate	16
γ-BHC (lindane)	8	endrin	16
cis-chlordane	8	endrin aldehyde	16
trans-chlordane	8	endrin ketone	16
4,4'-DDD	16	heptachlor	8
4,4'-DDE	16	heptachlor epoxide (isomer B)	8
4,4'-DDT	16	methoxychlor	80

In hexane:toluene (1:1), 1 mL/ampul
cat.# 32292 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
cis-chlordane
trans-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32415 (ea.)

also available

Rtx®-CLPesticides/
Rtx®-CLPesticides2
Capillary Column Pair
Analyze all 20 organochlorine pesticides and their surrogates simultaneously.

See **pages 62–63**.

Pesticide Surrogate Mix (2 components)

decachlorobiphenyl
2,4,5,6-tetrachloro-*m*-xylene

200 µg/mL each in acetone, 1 mL/ampul
cat.# 32000 (ea.)

200 µg/mL each in acetone, 5 mL/ampul
cat.# 32457 (ea.)

Pesticide Surrogate Mix (2 components)

decachlorobiphenyl	200 µg/mL
2,4,5,6-tetrachloro-*m*-xylene	100

In acetone, 1 mL/ampul
cat.# 32453 (ea.)

TCLP Pesticide Mix (5 components)

γ-BHC (lindane)
endrin
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32013 (ea.)

TCLP Toxaphene Mix

toxaphene

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32015 (ea.)

TCLP Chlordane Mix

chlordane

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32016 (ea.)

SOM01.1 (Pesticides), QA Mixes

Pesticide Surrogate Mix (2 components)

decachlorobiphenyl	200 µg/mL
2,4,5,6-tetrachloro-*m*-xylene	100

In acetone, 1 mL/ampul
cat.# 32453 (ea.)

Organochlorine Pesticide Resolution Check Mix (with surrogates) (22 components)

aldrin	10 µg/mL	4,4'-DDT	20
α-BHC	10	endosulfan I	10
β-BHC	10	endosulfan II	20
δ-BHC	10	endosulfan sulfate	20
γ-BHC (lindane)	10	endrin	20
cis-chlordane	10	endrin aldehyde	20
trans-chlordane	10	endrin ketone	20
decachlorobiphenyl (SS)	20	heptachlor	10
dieldrin	20	heptachlor epoxide (isomer B)	10
4,4'-DDD	20	methoxychlor	100
4,4'-DDE	20	2,4,5,6-tetrachloro-*m*-xylene (SS)	10

In hexane:toluene (90:10), 1 mL/ampul
cat.# 32454 (ea.)

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

04.2, 04.1, 03.2, 3/90, 4/89, and 2/88 SOW (Pesticides), QA Mixes

Pesticide Surrogate Mix (2 components)

See cat.#s 32000 and 32457 on page 486.

2,4,5,6-Tetrachloro-*m*-xylene

200 µg/mL in acetone, 1 mL/ampul
cat.# 32027 (ea.)

200 µg/mL in acetone, 5 mL/ampul
cat.# 32028 (ea.)

Decachlorobiphenyl (BZ #209)

200 µg/mL in acetone, 1 mL/ampul
cat.# 32029 (ea.)

200 µg/mL in acetone, 5 mL/ampul
cat.# 32030 (ea.)

10 µg/mL in isooctane, 1 mL/ampul
cat.# 32289 (ea.)

Dibutylchlorendate

200 µg/mL in acetone, 1 mL/ampul
cat.# 32025 (ea.)

Florisil® Cartridge Check Standard

2,4,5-trichlorophenol

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32017 (ea.)

Organochlorine Pesticide System Evaluation Mix

(2 components)

- Designed for daily assessment of system performance.
- Reveals active sites in the injection port and/or GC column.
- Prepared in MTBE—low expansion volume helps minimize backflash.

4,4'-DDT	200 µg/mL
endrin	100 µg/mL

In methyl *tert*-butyl ether, 1 mL/ampul
cat.# 32417 (ea.)

Pesticide Resolution Check Mix (7 components)

trans-chlordane	1 µg/mL	endosulfan sulfate	2
4,4'-DDE	2	endrin ketone	2
dieldrin	2	methoxychlor	10
endosulfan I	1		

In hexane, 1 mL/ampul
cat.# 32001 (ea.)

Pesticide Resolution Check Mix w/Surrogates

(9 components)

trans-chlordane	1 µg/mL	endosulfan sulfate	2
4,4'-DDE	2	endrin ketone	2
decachlorobiphenyl (SS)	2	methoxychlor	10
dieldrin	2	2,4,5,6-tetrachloro-*m*-xylene (SS)	2
endosulfan I	1		

In hexane, 1 mL/ampul
cat.# 32073 (ea.)

Pesticide Performance Evaluation Mix (6 components)

α-BHC	1 µg/mL	4,4'-DDT	10
β-BHC	1	endrin	5
γ-BHC (lindane)	1	methoxychlor	25

In hexane, 1 mL/ampul
cat.# 32002 (ea.)

Pesticide Performance Evaluation Mix w/Surrogates

(8 components)

α-BHC	1 µg/mL	decachlorobiphenyl (SS)	2
β-BHC	1	endrin	5
γ-BHC (lindane)	1	methoxychlor	25
4,4'-DDT	10	2,4,5,6-tetrachloro-*m*-xylene (SS)	2

In hexane, 1 mL/ampul
cat.# 32074 (ea.)

tech tip

Working with solutions containing decachlorobiphenyl

Decachlorobiphenyl has poor solubility in most organic solvents. The maximum concentration that can be prepared in acetone, hexane, or isooctane is 200 µg/mL. Temperature will affect the solubility as well. Storing solutions at reduced temperatures will cause decachlorobiphenyl to precipitate.

Products containing decachlorobiphenyl must be sonicated for a minimum of 10 minutes prior to opening the ampul. Because each ultrasonic bath operates at a different energy level, 10 minutes is a guideline only. Longer sonication time will not affect product quality.

These precautions apply to working solutions prepared in your laboratory as well. The amount of compound that precipitates depends on concentration AND temperature. If you store your standards at a temperature lower than 4 °C (even dilute solutions), allow extra sonication time.

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

CLP Pesticides Mixtures, QA Mixes

Pesticide Matrix Spike Mix (6 components)

aldrin	25 µg/mL	dieldrin	50
γ-BHC (lindane)	25	endrin	50
4,4'-DDT	50	heptachlor	25

In acetone, 1 mL/ampul

cat.# 32018 (ea.)

Pesticide Matrix Spike Mix (2/88 SOW) (6 components)

aldrin	200 µg/mL	dieldrin	500
γ-BHC (lindane)	200	endrin	500
4,4'-DDT	500	heptachlor	200

In methanol, 1 mL/ampul

cat.# 32031 (ea.)

Pesticide Evaluation Mix (2/88 SOW) (4 components)

aldrin	4,4'-DDT
dibutylchlorendate (SS)	endrin

100 µg/mL each in hexane, 1 mL/ampul

cat.# 32032 (ea.)

For complete listing of PCB reference standards, see pages 494–496.

Low-Concentration Pesticides Mixtures, QA Mixes

L/C Pesticide Lab Control Sample (7 components)

γ-BHC (lindane)	10 µg/mL	endosulfan sulfate	20
trans-chlordane	10	endrin	20
4,4'-DDE	20	heptachlor epoxide (isomer B)	10
dieldrin	20		

In acetone, 1 mL/ampul

cat.# 32040 (ea.)

CLP Pesticides Mixtures, Calibration Mixes

Pesticide Standard Mix A (2/88 SOW) (10 components)

aldrin	10 µg/mL	endosulfan II	20
γ-BHC (lindane)	5	endrin aldehyde	25
4,4'-DDT	20	heptachlor	10
dieldrin	10	heptachlor epoxide (isomer B)	10
endosulfan I	10	methoxychlor	100

In hexane, 1 mL/ampul

cat.# 32033 (ea.)

Pesticide Standard Mix B (2/88 SOW) (11 components)

aldrin	10 µg/mL	4,4'-DDD	20
α-BHC	5	4,4'-DDE	10
β-BHC	10	endosulfan sulfate	20
δ-BHC	10	endrin	10
cis-chlordane	10	endrin ketone	20
trans-chlordane	10		

In hexane, 1 mL/ampul

cat.# 32034 (ea.)

CLP Pesticides Mixtures, Calibration Mixes, *cont.*

Pesticide Standard Mix A (9 components)

α-BHC	5 µg/mL	endosulfan I	5
γ-BHC (lindane)	5	endrin	10
4,4'-DDD	10	heptachlor	5
4,4'-DDT	10	methoxychlor	50
dieldrin	10		

In hexane:toluene (90:10), 1 mL/ampul

cat.# 32297 (ea.)

Pesticide Standard Mix B (11 components)

aldrin	5 µg/mL	endosulfan II	10
β-BHC	5	endosulfan sulfate	10
δ-BHC	5	endrin aldehyde	10
cis-chlordane	5	endrin ketone	10
trans-chlordane	5	heptachlor epoxide (isomer B)	5
4,4'-DDE	10		

In hexane:toluene (90:10), 1 mL/ampul

cat.# 32298 (ea.)

Organochlorine Pesticide Mix AB #1 (20 components)

aldrin	dieldrin
α-BHC	endosulfan I
β-BHC	endosulfan II
δ-BHC	endosulfan sulfate
γ-BHC (lindane)	endrin
cis-chlordane	endrin aldehyde
trans-chlordane	endrin ketone
4,4'-DDD	heptachlor
4,4'-DDE	heptachlor epoxide (isomer B)
4,4'-DDT	methoxychlor

200 µg/mL each in hexane:toluene (1:1), 1 mL/ampul

cat.# 32291 (ea.)

Organochlorine Pesticide Mix AB #2 (20 components)

aldrin	8 µg/mL	dieldrin	16
α-BHC	8	endosulfan I	8
β-BHC	8	endosulfan II	16
δ-BHC	8	endosulfan sulfate	16
γ-BHC (lindane)	8	endrin	16
cis-chlordane	8	endrin aldehyde	16
trans-chlordane	8	endrin ketone	16
4,4'-DDD	16	heptachlor	8
4,4'-DDE	16	heptachlor epoxide (isomer B)	8
4,4'-DDT	16	methoxychlor	80

In hexane:toluene (1:1), 1 mL/ampul

cat.# 32292 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin	dieldrin
α-BHC	endosulfan I
β-BHC	endosulfan II
δ-BHC	endosulfan sulfate
γ-BHC (lindane)	endrin
cis-chlordane	endrin aldehyde
trans-chlordane	endrin ketone
4,4'-DDD	heptachlor
4,4'-DDE	heptachlor epoxide (isomer B)
4,4'-DDT	methoxychlor

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul

cat.# 32415 (ea.)

Pesticides, Chlorinated/Organochlorine/Organohalide, *cont.*

Pesticides Calibration Mixtures

Components of these products are at 16x the contract-required quantitation level (CRQL) and can be used to prepare calibration mixes at 4x CRQL and at 1x CRQL by serial dilution.

Pesticide Standard Mix A w/Surrogates (11 components)

α-BHC	8 µg/mL	endosulfan I	8
γ-BHC (lindane)	8	endrin	16
4,4'-DDD	16	heptachlor	8
4,4'-DDT	16	methoxychlor	80
decachlorobiphenyl (SS)	16	2,4,5,6-tetrachloro-*m*-xylene (SS)	8
dieldrin	16		

In hexane, 1 mL/ampul

cat.# 32003 (ea.)

Pesticide Standard Mix B w/Surrogates (13 components)

aldrin	8 µg/mL	endosulfan II	16
β-BHC	8	endosulfan sulfate	16
δ-BHC	8	endrin aldehyde	16
cis-chlordane	8	endrin ketone	16
trans-chlordane	8	heptachlor epoxide (isomer B)	8
4,4'-DDE	16	2,4,5,6-tetrachloro-*m*-xylene (SS)	8
decachlorobiphenyl (SS)	16		

In hexane, 1 mL/ampul

cat.# 32004 (ea.)

Pesticide Kit #3

Calibration mixes only for CLP 04.1. Includes pesticide standard mixes A & B at 16x CRQL with surrogates.

Contains 1 mL each of these mixtures.
32003: Pesticide Standard Mix A w/Surrogates
32004: Pesticide Standard Mix B w/Surrogates
32005: Toxaphene
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32039: Aroclor 1016/1260

cat.# 32404 (kit) **kit**

Chlordane, Toxaphene Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
chlordane	57-74-9	H	1,000	32021
chlordane	57-74-9	I	5,000	32072
chlordane	57-74-9	M	2,000	32016
toxaphene	8001-35-2	H	1,000	32005
toxaphene	8001-35-2	I	5,000	32071
toxaphene	8001-35-2	M	2,000	32015

H = hexane; I = isooctane; M = methanol

Pesticides, Nitrogen/Phosphorus

Method 507 (Nitrogen & Phosphorus Pesticides)

Organonitrogen Pesticide Mix #1 (Rev), Method 525.2

(37 components)

alachlor
ametryn
atraton
atrazine
bromacil
butachlor
butylate
chlorpropham
cyanazine (Bladex)
cycloate
diphenamid
EPTC
etridiazole (Terrazole)
fenarimol
fluridone (Sonar)
hexazinone (Velpar)
metolachlor
metribuzin
MGK-264
molinate
napropamide (Devrinol)
norflurazon
pebulate
prometon
prometryne
pronamide (propyzamide)
propachlor
propazine
simazine
simetryn
tebuthiuron
terbacil
terbutryn
triadimefon
tricyclazole (Beam)
trifluralin
vernolate

500 µg/mL each in acetone, 1 mL/ampul

cat.# 33012 (ea.)

Organophosphorus Pesticide Mix #1 (Rev), Method 525.2 (7 components)

chlorpyrifos (Dursban)
dichlorvos (DDVP)
disulfoton sulfone
ethoprop (ethoprophos)
methyl paraoxon (parathion methyl-O-analog)
mevinphos (phosdrin)
stirofos (tetrachlorvinphos)

500 µg/mL each in acetone, 1 mL/ampul

cat.# 33013 (ea.)

Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2

(6 components)

carboxin
diazinon
disulfoton
fenamiphos
merphos
terbufos

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 32423 (ea.)

Pesticides, Organophosphorus

Method 8140, 8141 (Organophosphorus Pesticides)

The preparation of accurate and stable OP standards is complicated by their sensitivity to light, pH, heat, and water. Restek has overcome these issues through our ongoing research into OP pesticide mixtures to save your lab time and effort.

- Solvents are assayed to ensure low water content.
- Reference mixtures are stored in deactivated amber ampuls, under an inert atmosphere.
- Purity is determined by a combination of methods: GC-FID, HPLC, GC-ECD, GC-MS, LC-MS, refractive index, and melting point.

8140/8141 Internal Standards & Surrogates

NPD Detector:

Internal Standard: 1-bromo-2-nitrobenzene (cat.# 32279)
Surrogate: 4-chloro-3-nitrobenzotrifluoride (cat.# 32282)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32279 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32282 (ea.)

FPD Detector:

Internal Standard: none recommended
Surrogate: tributylphosphate (cat.# 32280) and triphenylphosphate (cat.# 32281)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32280 (ea.)

1,000 µg/mL in acetone, 1 mL/ampul
cat.# 32281 (ea.)

8140/8141 OP Pesticide Calibration Mix A

(20 components)

azinphos methyl
bolstar (sulprofos)
chlorpyrifos
coumaphos
demeton, O & S
diazinon
dichlorvos
disulfoton
ethoprophos
fensulfothion
fenthion
merphos
methyl parathion
mevinphos
naled
phorate
ronnel
stirofos
tokuthion (prothiofos)
trichloronate

200 µg/mL each in hexane:acetone (95:5), 1 mL/ampul
cat.# 32277 (ea.)

8141 OP Pesticide Calibration Mix B (7 components)

dimethoate
EPN
malathion
monocrotophos
parathion
sulfotepp
TEPP

200 µg/mL each in hexane:acetone (95:5), 1 mL/ampul
cat.# 32278 (ea.)

International-Specific

Canadian Drinking Water OP Pesticides Mix

(9 components)

azinphos methyl (Guthion)
chlorpyrifos (Dursban)
Diazinon
dimethoate
malathion
parathion (ethyl)
phorate
temephos (Abate)
terbufos

1,000 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31867 (ea.)

Organophosphorus Pesticide Mix, European Formulation (16 components)

acephate	200 µg/mL	methamidophos	500
azinphos methyl (Guthion)	400	methidathion	200
chlorpyrifos	100	omethoate	1,000
demeton-S-methyl	200	pirimiphos methyl	100
dichlorvos (DDVP)	500	profenfos	200
dimethoate	200	pyrazophos	500
ethion	200	tokuthion (prothiofos)	200
malathion	200	tolclofos-methyl	100

In acetone, 1 mL/ampul
cat.# 32418 (ea.)

also available

30 m x 0.32 mm ID x 0.50 µm
Rtx®-OP Pesticides Column

Provides fast analyses, low bleed, and better resolution than alternative choices.

See **page 61** for details.

Pesticides, Pesticides & Flame Retardants

Method 527 (Pesticides & Flame Retardants - GC-MS)

Internal Standard, Method 527 (3 components)

acenaphthene-d10
chrysene-d12
phenanthrene-d10

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33010 (ea.)

Method 525.2 Internal Standard Mix (3 components)

acenaphthene-d10
chrysene-d12
phenanthrene-d10

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31825 (ea.)

Surrogate Standard, Method 527 (3 components)

1,3-dimethyl-2-nitrobenzene
perylene-d12
triphenylphosate

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33009 (ea.)

Method 525.2 Surrogate Standard Mix (4 components)

2-nitro-*m*-xylene
perylene-d12
pyrene-d10
triphenylphosphate

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31826 (ea.)

PBDE Mix (5 components)

2,2',4,4',5-pentabromodiphenyl ether (BDE-99)
2,2',4,4',5,5'-hexabromobiphenyl
2,2',4,4',5,5'-hexabromodiphenyl ether (BDE-153)
2,2',4,4',6-pentabromodiphenyl ether (BDE-100)
2,2',4,4'-tetrabromodiphenyl ether (BDE-47)

50 µg/mL each in isooctane:ethyl acetate (4:1), 1 mL/ampul
cat.# 33098 (ea.)

Pesticides Mix #1, Method 527 (16 components)

atrazine
bifenthrin
esbiol (Bioallethrin, S-cyclopentyl isomer)
bromacil
esfenvalarate
fenvalarate
hexazinone
kepone
mirex
nitrofen
norflurazon
oxychlordane
prometryne
propazine
thiobencarb
vinclozolin

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 33007 (ea.)

Pesticides Mix #2, Method 527 (5 components)

chloropyrifos (Dursban)
dimethoate
malathion
parathion
terbufos sulfone

500 µg/mL each in ethyl acetate, 1 mL/ampul
cat.# 33008 (ea.)

Pesticides, Phenylurea

Method 532 (Phenylurea Pesticides)

Phenylurea Surrogate Mixture (2 components)

carbazole
monuron

500 µg/mL each in methanol:acetonitrile (50:50), 1 mL/ampul
cat.# 32433 (ea.)

Phenylurea Pesticide Mixture (8 components)

diflubenzuron
diuron
fluometuron
linuron
propanil
siduron
tebuthiuron
thidiazuron

200 µg/mL each in acetonitrile:acetone (90:10), 1 mL/ampul
cat.# 32434 (ea.)

Pesticides, Chlordane, Toxaphene

Chlordane, Toxaphene Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
chlordane	57-74-9	H	1,000	32021
chlordane	57-74-9	I	5,000	32072
chlordane	57-74-9	M	2,000	32016
toxaphene	8001-35-2	H	1,000	32005
toxaphene	8001-35-2	I	5,000	32071
toxaphene	8001-35-2	M	2,000	32015

H = hexane; I = isooctane; M = methanol

Pesticides, State-Specific

Minnesota Department of Agriculture List 1 Pesticides

Minnesota Ag List 1 Pesticides Mix A (16 components)

acetochlor
alachlor
atrazine
cyanazine
desethylatrazine
desisopropylatrazine
dimethenamid*
ethalfluralin
metolachlor
metribuzin
pendimethalin
prometon
propachlor
propazine
simazine
trifluralin

200 ppm each in acetone, 1 mL/ampul
cat.# 32406 (ea.)

*Added to Minnesota Department of Agriculture List 1 pesticide (neutrals) incident investigation requirements, effective January 1, 2000.[1] CAS # 87674-68-8 manufactured by several companies under various trade names.
[1]Analytical Lists for Pesticide Incident Investigations, Minnesota Department of Agriculture, Guidance Document 26 (3/99), St. Paul, MN. For a copy, visit their website at: **www.mda.state.mn.us**

Minnesota Ag List 1 Pesticides Mix B (6 components)

chlorpyrifos
EPTC
fonofos
phorate
terbufos
triallate

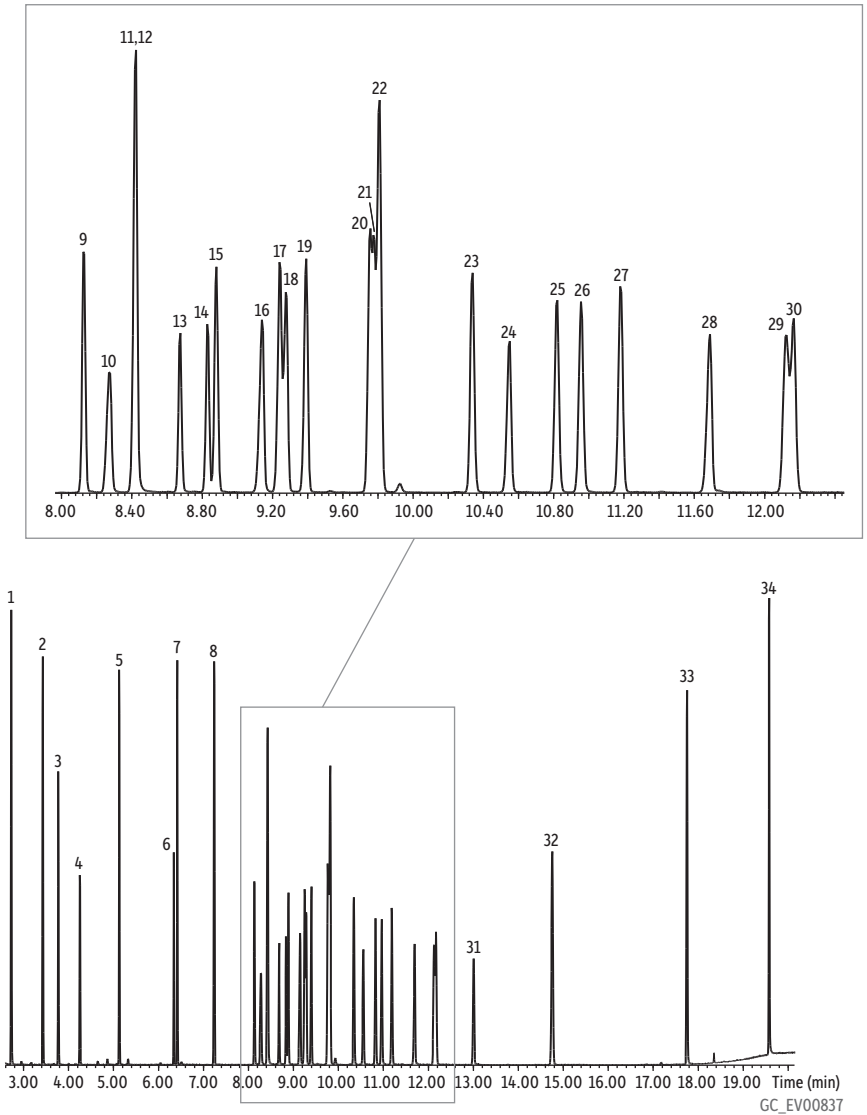
200 ppm each in acetone, 1 mL/ampul
cat.# 32407 (ea.)

Minnesota Ag List 1 Pesticide Kit

Contains 1 mL each of these mixtures.
32406: Minnesota Ag List Pesticides Mix A
32407: Minnesota Ag List Pesticides Mix B

cat.# 32408 (kit) kit

Minnesota Dept. of Agriculture List 1 Pesticides on Rxi®-1ms



Peaks
1. 2-Fluorophenol (SS)
2. Phenol-d6 (SS)
3. 1,4-Dichlorobenzene-d4 (IS)
4. Nitrobenzene-d5 (SS)
5. Naphthalene-d8 (IS)
6. EPTC
7. 2-Fluorobiphenyl (SS)
8. Acenaphthene-d10 (IS)
9. Propachlor
10. Desisopropylatrazine
11. Desethyl-atrazine
12. 2,4,6-Tribromophenol (SS)
13. Ethalfluralin
14. Trifluralin
15. Phorate
16. Simazine
17. Prometon
18. Atrazine
19. Propazine
20. Terbufos
21. Fonofos
22. Phenanthrene-d10 (IS)
23. Triallate
24. Metribuzin
25. Dimethenamid
26. Acetochlor
27. Alachlor
28. Cyanazine
29. Metolachlor
30. Chlorpyrifos
31. Pendimethalin
32. *p*-Terphenyl-d14 (SS)
33. Chrysene-d12 (IS)
34. Perylene-d12 (IS)

Column	Rxi®-1ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13323)
Sample	Minnesota Ag List 1 Pesticides Mix A (cat.# 32406) Minnesota Ag List 1 Pesticides Mix B (cat.# 32407) SV Internal Standard Mix (cat.# 31206) B/N Surrogate Mix (4/89 SOW) (cat.# 31024) Acid Surrogate Mix (4/89 SOW) (cat.# 31025)
Conc.:	10 µg/mL each analyte (internal standards 25 µg/ml)
Injection	
Inj. Vol.:	1.0 µL split (split ratio 10:1)
Liner:	Drilled Uniliner (hole near bottom) (cat.# 20771)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	70 °C (hold 1 min) to 180 °C at 20 °C/min to 230 °C at 5 °C/min to 325 °C at 40 °C/min (hold 3.5 min)
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Solvent Delay Time:	2.5 min
Tune Type:	DFTPP
Ionization Mode:	EI
Scan Range:	35-550 amu
Instrument	HP6890 GC & 5973 MSD

Phenols

Method 528 (Phenols)

- Reference materials for U.S. EPA Method 528.
- Fortification solution formulated based on MS sensitivity to each analyte.

Internal Standard Mix, EPA 528 (2 components)

3-nitro-*o*-xylene	1,000 µg/mL
2,3,4,5-tetrachlorophenol	2,000

In methylene chloride, 1 mL/ampul

cat.# 31696 (ea.)

Surrogate Standard Mix, EPA 528 (3 components)

2-chlorophenol-d4	1,000 µg/mL	2,4,6-tribromophenol	2,000
2,4-dimethylphenol-3,5,6-d3	1,000		

In methanol, 1 mL/ampul

cat.# 31697 (ea.)

Phenol Calibration Mix, EPA 528 (12 components)

4-chloro-3-methylphenol	2-methyl-4,6-dinitrophenol
2-chlorophenol	2-nitrophenol
o-cresol	4-nitrophenol
2,4-dichlorophenol	pentachlorophenol
2,4-dimethylphenol	phenol
2,4-dinitrophenol	2,4,6-trichlorophenol

2,000 µg/mL each in methylene chloride, 1 mL/ampul

cat.# 31694 (ea.)

Phenols Fortification Mix, EPA 528 (12 components)

4-chloro-3-methylphenol	100 µg/mL	2-methyl-4,6-dinitrophenol	500
2-chlorophenol	100	2-nitrophenol	100
o-cresol	100	4-nitrophenol	500
2,4-dichlorophenol	100	pentachlorophenol	500
2,4-dimethylphenol	100	phenol	100
2,4-dinitrophenol	500	2,4,6-trichlorophenol	100

In methanol, 1 mL/ampul

cat.# 31695 (ea.)

Method 604 (Phenols)

604 Phenols Calibration Mix (11 components)

4-chloro-3-methylphenol	2-nitrophenol
2-chlorophenol	4-nitrophenol
2,4-dichlorophenol	pentachlorophenol
2,4-dimethylphenol	phenol
2,4-dinitrophenol	2,4,6-trichlorophenol
2-methyl-4,6-dinitrophenol	

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 31029 (ea.)

Method 8040 (Phenols)

8040 Surrogate Mix (2 components)

2-fluorophenol
2,4,6-tribromophenol

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31090 (ea.)

8040 Phenols Mix #1 (9 components)

4-chloro-3-methylphenol	4-nitrophenol
2,4-dichlorophenol	pentachlorophenol
2-methyl-4,6-dinitrophenol	phenol
3-methylphenol	2,4,6-trichlorophenol
2-nitrophenol	

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31088 (ea.)

8040 Phenols Mix #2 (9 components)

sec-butyl-4,6-dinitrophenol (dinoseb)	2-methylphenol
2-chlorophenol	4-methylphenol
2,6-dichlorophenol	2,3,4,6-tetrachlorophenol
2,4-dimethylphenol	2,4,5-trichlorophenol
2,4-dinitrophenol	

2,000 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31089 (ea.)

Phthalates (Phthalate Esters)

Method 506 (Phthalate & Adipate Esters)

506 Calibration Mix (7 components)

benzyl butyl phthalate
bis(2-ethylhexyl)adipate
bis(2-ethylhexyl)phthalate
di-*n*-butylphthalate
di-*n*-octyl phthalate
diethylphthalate
dimethylphthalate

1,000 µg/mL in isooctane, 1 mL/ampul
cat.# 31845 (ea.)

Method 606 (Phthalate Esters)

606 Phthalate Esters Calibration Mix (6 components)

bis(2-ethylhexyl)phthalate
butyl benzyl phthalate
diethyl phthalate
dimethyl phthalate
di-*n*-butyl phthalate
di-*n*-octyl phthalate

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31031 (ea.)

Method 8061A (Phthalate Esters)

8061A Matrix Spike Solution (2 components)

benzyl butyl phthalate
bis(2-ethylhexyl)phthalate

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31846 (ea.)

Benzyl Benzoate (Internal Standard)

5,000 µg/mL in hexane, 1 mL/ampul
cat.# 31847 (ea.)

8061A Surrogate Standard (3 components)

dibenzyl phthalate
diphenyl isophthalate
diphenyl phthalate

500 µg/mL each in acetone, 1 mL/ampul
cat.# 31848 (ea.)

EPA 8061A Phthalate Esters Mixture (15 components)

benzyl butyl phthalate
bis(2-*n*-butoxyethyl)phthalate
bis(2-ethoxyethyl)phthalate
bis(2-ethylhexyl)phthalate
bis(2-methoxyethyl)phthalate
bis(4-methyl-2-pentyl)phthalate
di-*n*-butylphthalate
diethylphthalate
di-*n*-hexyl phthalate
dimethylphthalate
di-nonyl phthalate
di-*n*-octyl phthalate
dipentylphthalate
phthalic acid dicyclohexyl ester
phthalic acid diisobutyl ester

1,000 µg/mL each in hexane:acetone (80:20), 1 mL/ampul
cat.# 33227 (ea.)

Polybrominated Diphenyl Ethers (PBDEs)

See page 491.

Polychlorinated Biphenyls (PCBs)

PCB Aroclors

608 Complete Kit

Contains 1 mL each of these mixtures.
32022: 608 Calibration Mix
32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260
32005: toxaphene
32021: chlordane

cat.# 32060 (kit) kit

PCB Kit #1

1,000 µg/mL each in hexane, 1 mL/ampul
32006: Aroclor 1016
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32012: Aroclor 1260

cat.# 32089 (kit) kit

PCB Kit #2

200 µg/mL each in isooctane, 1 mL/ampul
32064: Aroclor 1016
32065: Aroclor 1221
32066: Aroclor 1232
32067: Aroclor 1242
32068: Aroclor 1248
32069: Aroclor 1254
32070: Aroclor 1260

cat.# 32090 (kit) kit

PCB Kit #3

1,000 µg/mL each in hexane, 1 mL/ampul
32007: Aroclor 1221
32008: Aroclor 1232
32009: Aroclor 1242
32010: Aroclor 1248
32011: Aroclor 1254
32039: Aroclor 1016/1260

cat.# 32400 (kit) kit

Polychlorinated Biphenyls (PCBs), *cont.*

PCB Kit #4

200 µg/mL each in isooctane, 1 mL/ampul
32065: Aroclor 1221
32066: Aroclor 1232
32067: Aroclor 1242
32068: Aroclor 1248
32069: Aroclor 1254
32299: Aroclor 1016/1260

cat.# 32401 (kit) **kit**

Aroclor Solutions

Volume is 1 mL/ampul. Concentration is µg/mL unless otherwise noted.

Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	H	1,000	32006
Aroclor 1016	12674-11-2	I	200	32064
Aroclor 1016	12674-11-2	TO	50 mg/kg	32075
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1221	11104-28-2	H	1,000	32007
Aroclor 1221	11104-28-2	I	200	32065
Aroclor 1221	11104-28-2	TO	50 mg/kg	32077
Aroclor 1221	11104-28-2	TO	500 mg/kg	32078
Aroclor 1232	11141-16-5	H	1,000	32008
Aroclor 1232	11141-16-5	I	200	32066
Aroclor 1232	11141-16-5	TO	50 mg/kg	32079
Aroclor 1232	11141-16-5	TO	500 mg/kg	32080
Aroclor 1242	53469-21-9	H	1,000	32009
Aroclor 1242	53469-21-9	I	200	32067
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1248	12672-29-6	H	1,000	32010
Aroclor 1248	12672-29-6	I	200	32068
Aroclor 1248	12672-29-6	TO	50 mg/kg	32083
Aroclor 1248	12672-29-6	TO	500 mg/kg	32084
Aroclor 1254	11097-69-1	H	1,000	32011
Aroclor 1254	11097-69-1	I	200	32069
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1260	11096-82-5	H	1,000	32012
Aroclor 1260	11096-82-5	I	200	32070
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088
Aroclor 1262	37324-23-5	H	1,000	32409
Aroclor 1268	11100-14-4	H	1,000	32410
Aroclor 1016/1260		H	1,000	32039
Aroclor 1016/1260		I	200	32299
Aroclor 1016/1260		A	400	32456

A = acetone; H = hexane; I = isooctane; TO = transformer oil (PCB-free)

please note

We test our transformer oil solvent to ensure that it is PCB-free.

PCB Congeners

Method 525.2 (Semivolatile Organics)

Method 525.2 PCB Congener Mix (8 components)

2-chlorobiphenyl (BZ #1)
2,3-dichlorobiphenyl (BZ #5)
2,4,5-trichlorobiphenyl (BZ #29)
2,2',4,4'-tetrachlorobiphenyl (BZ #47)
2,2',3',4,6-pentachlorobiphenyl (BZ #98)
2,2',4,4',5,6'-hexachlorobiphenyl (BZ #154)
2,2',3,3',4,4',6-heptachlorobiphenyl (BZ #171)
2,2',3,3',4,5',6,6'-octachlorobiphenyl (BZ #200)

200 µg/mL each in acetone, 1 mL/ampul
cat.# 32420 (ea.)

Method 8082, 8082A (PCBs)

PCB Congener Mix, Method 8082A (19 components)

2-chlorobiphenyl (BZ #1)
2,3-dichlorobiphenyl (BZ #5)
2,2',5-trichlorobiphenyl (BZ #18)
2,4',5-trichlorobiphenyl (BZ #31)
2,2',3,5'-tetrachlorobiphenyl (BZ #44)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,3',4,4'-tetrachlorobiphenyl (BZ #66)
2,2',3,4,5'-pentachlorobiphenyl (BZ #87)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,3,3',4',6-pentachlorobiphenyl (BZ #110)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',3,4,5,5'-hexachlorobiphenyl (BZ #141)
2,2',3,5,5',6-hexachlorobiphenyl (BZ #151)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,3',4,4',5-heptachlorobiphenyl (BZ #170)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)
2,2',3,4,4',5',6-heptachlorobiphenyl (BZ #183)
2,2',3,4',5,5',6-heptachlorobiphenyl (BZ #187)
2,2',3,3',4,4',5,5',6-nonachlorobiphenyl (BZ #206)

100 µg/mL each in isooctane, 1 mL/ampul
cat.# 32416 (ea.)

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Polychlorinated Biphenyls (PCBs), *cont.*

PCB Congeners, *cont.*

Miscellaneous

PCB Congeners

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2,4,4'-trichlorobiphenyl (BZ #28)	7012-37-5	I	10	32283
2,2',5,5'-tetrachlorobiphenyl (BZ #52)	35693-99-3	I	10	32284
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)	37680-73-2	I	10	32285
2,3',4,4',5-pentachlorobiphenyl (BZ #118)	31508-00-6	I	10	32293
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)	35065-28-2	I	10	32286
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)	35065-27-1	I	10	32287
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)	35065-29-3	I	10	32288
decachlorobiphenyl (BZ #209)	2051-24-3	I	10	32289

I = isooctane

PCB Congener Standard #1 (6 components)

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10 µg/mL each in isooctane, 1 mL/ampul
cat.# 32290 (ea.)

PCB Congener Standard #2 (7 components)

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,3',4,4',5-pentachlorobiphenyl (BZ #118)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10 µg/mL each in isooctane, 1 mL/ampul
cat.# 32294 (ea.)

Polycyclic Aromatic Hydrocarbons (PAHs)

See pages 473–475.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs)

Individual Semivolatile Surrogate and Internal Standards for EPA Methods

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
anthracene-d10	1719-06-08	D	2,000	31037
decafluorobiphenyl	434-90-2	D	2,000	31041
decafluorobiphenyl	434-90-2	A	1,000	31855
4,4'-dibromobiphenyl	92-86-4	D	2,000	31039
4,4'-dibromooctafluorobiphenyl	10386-84-2	D	2,000	31040
2-fluorobiphenyl	321-60-8	D	2,000	31091
1-fluoronaphthalene	321-38-0	D	2,000	31092
2-fluorophenol	367-12-4	D	2,000	31047
naphthalene-d8	1146-65-2	D	2,000	31043
nitrobenzene-d5	4165-60-0	D	2,000	31044
pentafluorophenol	771-61-9	D	2,000	31048
phenanthrene-d10	1517-22-2	D	2,000	31045
phenol-d6	13127-88-3	D	2,000	31049
pyridine-d5	7291-22-7	D	2,000	31046
p-terphenyl-d14	1718-51-0	D	1,000	31828
2,4,6-tribromophenol	118-79-6	M	1,000	31401

A = acetone; D = methylene chloride; M = methanol

SV Internal Standard Mix (6 components)

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
naphthalene-d8
perylene-d12
phenanthrene-d10

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

Method 525, 525.1, 525.2 (Semivolatile Organics)

Method 525.2 Internal Standard Mix (3 components)

acenaphthene-d10
chrysene-d12
phenanthrene-d10

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31825 (ea.)

Method 525.2 Surrogate Standard Mix (4 components)

2-nitro-*m*-xylene
perylene-d12
pyrene-d10
triphenylphosphate

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31826 (ea.)

Method 525.2 Herbicide Analytes

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
acetochlor	34256-82-1	M	100	33208
alachlor	15972-60-8	M	100	33207
metolachlor	51218-45-2	M	100	33209

M = methanol

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 525, 525.1, 525.2 (Semivolatile Organics), *cont.*

Method 525.2 Herbicide Mix (3 components)

acetochlor
alachlor
metolachlor

100 µg/mL in methanol, 1 mL/ampul
cat.# 33211 (ea.)

Method 525.2 Semivolatile Mix (revised)

(28 components)

acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzylbutylphthalate
bis(2-ethylhexyl)adipate
bis(2-ethylhexyl)phthalate
chrysene
dibenzo(a,h)anthracene
diethylphthalate
dimethylphthalate
di-*n*-butylphthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octylphthalate
fluoranthene
fluorene
hexachlorobenzene
hexachlorocyclopentadiene
indeno(1,2,3-cd)pyrene
isophorone
naphthalene
pentachlorophenol*
phenanthrene
pyrene

1,000 µg/mL each in acetone, 1 mL/ampul*
cat.# 31899 (ea.)

*pentachlorophenol at 4,000 µg/mL.

Method 525.2 PCB Congener Mix (8 components)

2-chlorobiphenyl (BZ #1)
2,3-dichlorobiphenyl (BZ #5)
2,4,5-trichlorobiphenyl (BZ #29)
2,2',4,4'-tetrachlorobiphenyl (BZ #47)
2,2',3',4,6-pentachlorobiphenyl (BZ #98)
2,2',4,4',5,6'-hexachlorobiphenyl (BZ #154)
2,2',3,3',4,4',6-heptachlorobiphenyl (BZ #171)
2,2',3,3',4,5',6,6'-octachlorobiphenyl (BZ #200)

200 µg/mL each in acetone, 1 mL/ampul
cat.# 32420 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
cis-chlordane
trans-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32415 (ea.)

Organophosphorus Pesticide Mix #1 (Rev), Method 525.2 (7 components)

chlorpyrifos (Dursban)
dichlorvos (DDVP)
disulfoton sulfone
ethoprop (ethoprophos)
methyl paraoxon (parathion methyl-O-analog)
mevinphos (phosdrin)
stirofos (tetrachlorvinphos)

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33013 (ea.)

Organonitrogen Pesticide Mix #1 (Rev), Method 525.2

(37 components)

alachlor
ametryn
atraton
atrazine
bromacil
butachlor
butylate
chlorpropham
cyanazine (Bladex)
cycloate
diphenamid
EPTC
etridiazole (Terrazole)
fenarimol
fluridone (Sonar)
hexazinone (Velpar)
metolachlor
metribuzin
MGK-264
molinate
napropamide (Devrinol)
norflurazon
pebulate
prometon
prometryne
pronamide (propyzamide)
propachlor
propazine
simazine
simetryn
tebuthiuron
terbacil
terbutryn
triadimefon
tricyclazole (Beam)
trifluralin
vernolate

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33012 (ea.)

Method 525.2 Nitrogen/Phosphorus Pesticide Mix #2

(6 components)

carboxin
diazinon
disulfoton
fenamiphos
merphos
terbufos

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 32423 (ea.)

Organochlorine Pesticide Mix #2 (Rev), Method 525.2

(8 components)

chlorobenzilate
chloroneb
chlorothalonil
DCPA (Dacthal)
heptachlor epoxide (isomer A)
trans-nonachlor
cis-permethrin
trans-permethrin

500 µg/mL each in acetone, 1 mL/ampul
cat.# 33011 (ea.)

Method 525.2 Fortification Recovery Standard

p-terphenyl-d14

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31828 (ea.)

Method 525.2 GC-MS Performance Check Mix

(3 components)

4,4'-DDT
DFTPP (decafluorotriphenylphosphine)
endrin

1,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31827 (ea.)

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 625 (Semivolatiles)

Semivolatiles MegaMix® Standard, EPA Method 625 (54 components)

MEGAMIX®

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl butyl phthalate
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
4-chloro-3-methylphenol
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
2,4-dichlorophenol
diethylphthalate
2,4-dimethylphenol
dimethylphthalate
di-*n*-butylphthalate
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octylphthalate
diphenylamine*
fluoranthene
fluorene
hexachlorobenzene
hexachloro-1,3-butadiene
hexachlorocyclopentadiene*
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
naphthalene
nitrobenzene
2-nitrophenol
4-nitrophenol
N-nitrosodimethylamine*
N-nitroso-di-*n*-propylamine
pentachlorophenol
phenanthrene
phenol
pyrene
1,2,4-trichlorobenzene
2,4,6-trichlorophenol

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31829 (ea.)

*Listed as an "additional compound" in Method 625 (listed compound N-nitrosodiphenylamine decomposes to MegaMix® component diphenylamine). The six other "additional compounds" are components in other Restek reference mixes used for Method 625: benzidine is included in cat.# 31030 (page 457); β-BHC, δ-BHC, endosulfan I, endosulfan II, endrin are in cat.# 32291 (page 486) and cat.# 32415 (page 486).

Method 625 (Semivolatiles), *cont.*

625 Kit

Because most laboratories do not routinely analyze pesticides, PCBs, toxaphene, and chlordane in their calibration mixtures for Method 625, these mixtures are not included in the 625 Kit. They may be purchased separately or in the 608 Complete Kit. See page 485.

Contains 1 mL each of these mixtures.
31029: 604 Phenols Mix
31030: 605 Benzidines Mix
31031: 606 Phthalate Esters Mix
31032: 607 Nitrosamines Mix
31033: 609 Nitroaromatics/Isophorone Mix
31011: 610 PAH Mix (SV Calibration Mix #5)
31034: 611 Haloethers Mix
31035: 612 Chlorinated Hydrocarbons Mix

cat.# 31036 (kit) kit

TCLP

TCLP B/N Mix (7 components)

1,4-dichlorobenzene
2,4-dinitrotoluene
hexachlorobenzene
hexachlorobutadiene
hexachloroethane
nitrobenzene
pyridine

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31028 (ea.)

Method 3500 (Organic Extraction Surrogates)

High-Concentration Surrogates and Matrix Spike Mixtures for SW-846

- Highest concentrations commercially available—reduces cost per sample extract.
- Convenient 1 mL and 5 mL packaging.

See Method 8270, pages 499–502.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270D, 8270C (Semivolatile Organic Compounds)

SV Internal Standard Mix (6 components)

- High purity for consistent results.
- Free quality assurance data package available online.
- Highest concentrations commercially available.

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
naphthalene-d8
perylene-d12
phenanthrene-d10

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

Revised SV Internal Standard Mix (7 components)

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
1,4-dioxane-d8
naphthalene-d8
perylene-d12
phenanthrene-d10

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31886	31886.15	31886.25

B/N Surrogate Mix (4/89 SOW) (3 components)

- High purity for consistent results.
- Free quality assurance data package available online.
- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes reduce cost per sample extract.

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31062	31062.15	31062.25
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31086	31086.15	31086.25
5,000 µg/mL each in methylene chloride, 10 mL/ampul		
33028	33028.15	33028.25

Revised B/N Surrogate Mix (4 components)

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14
pyrene-d10

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31887	31887.15	31887.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31888	31888.15	31888.25
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31889	31889.15	31889.25

Acid Surrogate Mix (4/89 SOW) (3 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

2-fluorophenol
phenol-d6
2,4,6-tribromophenol

Each	15-pk.	25-pk.
2,000 µg/mL each in methanol, 1 mL/ampul		
31025	31025.15	31025.25
10,000 µg/mL each in methanol, 1 mL/ampul		
31063	31063.15	31063.25
10,000 µg/mL each in methanol, 5 mL/ampul		
31087	31087.15	31087.25
10,000 µg/mL each in methanol, 10 mL/ampul		
33029	33029.15	33029.25

B/N Matrix Spike Mix (6 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

acenaphthene
1,4-dichlorobenzene
2,4-dinitrotoluene
N-nitroso-di-*n*-propylamine
pyrene
1,2,4-trichlorobenzene

Each	15-pk.	25-pk.
1,000 µg/mL each in methanol, 1 mL/ampul		
31004	31004.15	31004.25
5,000 µg/mL each in methanol, 1 mL/ampul		
31074	31074.15	31074.25
5,000 µg/mL each in methanol, 5 mL/ampul		
31084	31084.15	31084.25
5,000 µg/mL each in methanol, 10 mL/ampul		
33030	33030.15	33030.25

Acid Matrix Spike Mix (5 components)

- Highest concentrations commercially available.
- Convenient 1 mL, 5 mL, and 10 mL package sizes.
- Reduces laboratory cost per sample extract.

4-chloro-3-methylphenol
2-chlorophenol
4-nitrophenol
pentachlorophenol
phenol

Each	15-pk.	25-pk.
2,000 µg/mL each in methanol, 1 mL/ampul		
31014	31014.15	31014.25
10,000 µg/mL each in methanol, 1 mL/ampul		
31061	31061.15	31061.25
10,000 µg/mL each in methanol, 5 mL/ampul		
31071	31071.15	31071.25
10,000 µg/mL each in methanol, 10 mL/ampul		
33031	33031.15	33031.25

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270D, 8270C (Semivolatile Organic Compounds), *cont.*

GC-MS Tuning Mixture (4 components)

benzidine
4,4'-DDT
decafluorotriphenylphosphine (DFTPP)
pentachlorophenol

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31615 (ea.)

SV Tuning Compound

decafluorotriphenylphosphine (DFTPP)

2,500 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31001 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

Neat, 1 g
cat.# 33027 (ea.)

No data pack available.

8270 B/N Calibration Check Mix (7 components)

acenaphthene
benzo(a)pyrene
1,4-dichlorobenzene
di-*n*-octyl phthalate
diphenylamine
fluoranthene
hexachlorobutadiene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31616 (ea.)

8270 Acid Calibration Check Mix (6 components)

4-chloro-3-methylphenol
2,4-dichlorophenol
2-nitrophenol
pentachlorophenol
phenol
2,4,6-trichlorophenol

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31617 (ea.)

SV System Performance Check Mix (SPCC) (4 components)

2,4-dinitrophenol
hexachlorocyclopentadiene
4-nitrophenol
N-nitroso-di-*n*-propylamine

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31689 (ea.)

EASIER calibration

8270 MegaMix® standard and 8270 Matrix spike mix include 3-methylphenol and 4-methylphenol at 1/2 x concentration of other components.

8270 MegaMix® Standard (76 components)

MEGAMIX®

- Fewest mixtures needed for calibration and matrix spikes.
- Mixtures formulated for maximum stability.
- Contains most routinely analyzed compounds.

acenaphthene
acenaphthylene
aniline
anthracene
azobenzene[1]
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl alcohol
benzyl butyl phthalate
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)adipate
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
carbazole
4-chloroaniline
4-chloro-3-methylphenol
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
dibenzofuran
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
2,4-dichlorophenol
diethyl phthalate
2,4-dimethylphenol
dimethyl phthalate
di-*n*-butyl phthalate
1,2-dinitrobenzene
1,3-dinitrobenzene
1,4-dinitrobenzene
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octyl phthalate
diphenylamine[2]
fluoranthene
fluorene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
1-methylnaphthalene
2-methylnaphthalene
2-methylphenol
3-methylphenol*
4-methylphenol*
naphthalene
2-nitroaniline
3-nitroaniline
4-nitroaniline
nitrobenzene
2-nitrophenol
4-nitrophenol
N-nitrosodimethylamine
N-nitroso-di-*n*-propylamine
pentachlorophenol
phenanthrene
phenol
pyrene
pyridine
2,3,4,6-tetrachlorophenol
2,3,5,6-tetrachlorophenol
1,2,4-trichlorobenzene
2,4,5-trichlorophenol
2,4,6-trichlorophenol

1,000 µg/mL each in methylene chloride, 1 mL/ampul*
cat.# 31850 (ea.)

*3-methylphenol and 4-methylphenol concentration is 500 µg/mL.

[1]1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.

[2]N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

8270 Matrix Spike Mix (76 components)

MEGAMIX®

Same as 8270 MegaMix® standard list above.

Each	15-pk.	25-pk.
200 µg/mL each in methanol:methylene chloride (80:20), 5 mL/ampul*		
31687	31687.15	31687.25
200 µg/mL each in methanol:methylene chloride (80:20), 10 mL/ampul*		
33073	33073.15	33073.25

*3-methylphenol and 4-methylphenol concentration is 100 µg/mL.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270D, 8270C (Semivolatile Organic Compounds), *cont.*

605 Benzidines Calibration Mix (2 components)

benzidine
3,3'-dichlorobenzidine

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31030 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

8270 Benzidines Mix (3 components)

benzidine
3,3'-dichlorobenzidine
3,3'-dimethylbenzidine

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31688 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31852 (ea.)

8270/Appendix IX Kit

Contains 1 mL each of these mixtures.
31850: 8270 MegaMix Standard
31834: 605 Benzidines Calibration Mix
32459: Appendix IX Mix #1, Revised (Methapyrilene is not included in this revised standard.)
32460: Methapyrilene Standard
31806: Appendix IX Mix #2

cat.# 31815 (kit) kit

Appendix IX Mix #1, Revised (17 components)

2-acetylaminofluorene
4-aminobiphenyl
p-dimethylaminoazobenzene
3,3'-dimethylbenzidine (*o*-tolidine)
α,α-dimethylphenethylamine
1-naphthylamine
2-naphthylamine
N-nitrosodibutylamine
N-nitrosodiethylamine
N-nitrosomethylethylamine
N-nitrosomorpholine
N-nitrosopiperidine
N-nitrosopyrrolidine
5-nitro-*o*-toluidine
1,4-phenylenediamine
2-picoline
o-toluidine

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 32459 (ea.) NEW!

Methapyrilene Standard

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 32460 (ea.) NEW!

Appendix IX Mix #2 (32 components)

acetophenone
Aramite
atrazine
benzaldehyde
biphenyl
ε-caprolactam
chlorobenzilate
1-chloronaphthalene
diallate
dibenzo(a,j)acridine
2,6-dichlorophenol
7,12-dimethylbenz(a)anthracene
1,4-dioxane
diphenyl ether
ethyl methacrylate
ethyl methanesulfonate
hexachloropropene
isodrin
isosafrole (*cis* & *trans*)
kepone
3-methylcholanthrene
methyl methanesulfonate
1,4-naphthoquinone
4-nitroquinoline-N-oxide
pentachlorobenzene
pentachloroethane
pentachloronitrobenzene
phenacetin
pronamide
safrole
1,2,4,5-tetrachlorobenzene
1,3,5-trinitrobenzene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31806 (ea.)

Organophosphorus Pesticide Mix, 8270/Appendix IX (9 components)

dimethoate
disulfoton
famphur
methyl parathion
O,O,O-triethyl phosphorothioate
parathion (ethyl parathion)
phorate
sulfotepp
zinophos (thionazine)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 32419 (ea.)

Organochlorine Pesticide Mix AB # 3 (20 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
cis-chlordane
trans-chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000 µg/mL each in hexane:toluene (1:1), 1 mL/ampul
cat.# 32415 (ea.)

8270 Calibration Mix #1 (19 components)

benzoic acid
4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,6-dichlorophenol
2,4-dimethylphenol
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
dinoseb
2-methylphenol
3-methylphenol
4-methylphenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,3,4,6-tetrachlorophenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31618 (ea.)

8270 Calibration Mix #2 (11 components)

aniline
benzidine
4-chloroaniline
3,3'-dichlorobenzidine
diphenylamine*
2-nitroaniline
3-nitroaniline
4-nitroaniline
N-nitrosodimethylamine
N-nitrosodi-*n*-propylamine
pyridine

2,000 µg/mL each in methylene chloride:methanol (85:15), 1 mL/ampul
cat.# 31619 (ea.)

*N-nitrosodiphenylamine (8270-listed analyte) decomposes to diphenylamine (mix component) in the injector.

also available

Rxi®-5Sil MS Columns

Provide high response for 2,4-dinitrophenol, show excellent peak shape of pyridine, and produce outstanding resolution of PAHs.

See **page 64.**

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

Method 8270D, 8270C (Semivolatile Organic Compounds), *cont.*

8270 Calibration Mix #3 (23 components)

Aramite
bis(2-chloroethyl)ether
bis(2-chloroethoxy)methane
bis(2-chloroisopropyl)ether
4-bromophenyl phenyl ether
chlorobenzilate
2-chloronaphthalene
4-chlorophenyl phenyl ether
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,3-dinitrobenzene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
hexachloropropene
isodrin
kepone
pentachlorobenzene
pentachloronitrobenzene
1,2,4,5-tetrachlorobenzene
1,2,4-trichlorobenzene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31620 (ea.)

8270 Calibration Mix #4 (22 components)

acetophenone
azobenzene*
benzyl alcohol
bis(2-ethylhexyl)phthalate
butyl benzyl phthalate
dibenzofuran
diethyl phthalate
dimethyl phthalate
di-*n*-butyl phthalate
di-*n*-octyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
ethyl methanesulfonate
isophorone
isosafrole (*cis* & *trans*)
methyl methanesulfonate
1,4-naphthoquinone
nitrobenzene
4-nitroquinoline-1-oxide
phenacetin
safrole
1,3,5-trinitrobenzene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31621 (ea.)

*1,2-diphenylhydrazine (8270-listed analyte) decomposes to azobenzene (mix component) in the injector.

3-Methylcholanthrene Standard

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31996 (ea.)

NEW!

8270 Calibration Mix #5, Revised (18 components)

acenaphthene
acenaphthylene
anthracene
benz(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
1-methylnaphthalene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31995 (ea.)

NEW!

8270 Calibration Mix #6 (10 components)

diallate (*cis* & *trans*)
dimethoate
disulfoton
famphur
methyl parathion
parathion
phorate
pronamide
thionazine (zinophos)
O,O,O-triethyl phosphorothioate

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31623 (ea.)

Aramite

2,000 µg/mL in hexane, 1 mL/ampul
cat.# 31624 (ea.)

1,2-diphenylhydrazine

1,000 µg/mL in methanol, 1 mL/ampul
cat.# 31497 (ea.)

No data pack available.

Note that 1,2-diphenylhydrazine is an unstable compound that will oxidize to azobenzene, thereby decreasing the concentration of 1,2-diphenylhydrazine over time. For accurate calibration results, it is recommended that the concentrations of 1,2-diphenylhydrazine and azobenzene be combined. Please contact Restek Technical Service if you have any questions about this issue.

TCLP Acid Mix (6 components)

2-methylphenol
3-methylphenol
4-methylphenol
pentachlorophenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31027 (ea.)

TCLP B/N Mix (7 components)

1,4-dichlorobenzene
2,4-dinitrotoluene
hexachlorobenzene
hexachlorobutadiene
hexachloroethane
nitrobenzene
pyridine

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31028 (ea.)

8270/Appendix IX Calibration Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
31618: 8270 Calibration Mix #1
31619: 8270 Calibration Mix #2
31620: 8270 Calibration Mix #3
31621: 8270 Calibration Mix #4
31995: 8270 Calibration Mix #5, Revised
31996: 3-Methylcholanthrene Standard
31623: 8270 Calibration Mix #6
32459: Appendix IX Mix #1, Revised (Methapyrilene is not included in this revised standard.)
32460: Methapyrilene Standard

cat.# 31627 (kit)

kit

8270 Calibration Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
31618: 8270 Calibration Mix #1
31619: 8270 Calibration Mix #2
31620: 8270 Calibration Mix #3
31621: 8270 Calibration Mix #4
31995: 8270 Calibration Mix #5, Revised
31996: 3-Methylcholanthrene Standard

cat.# 31626 (kit)

kit

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

SOM01.1 (Semivolatiles), QA Mixes

SOM01.1 Deuterated Monitoring Compound Mix SIM Compounds (2 components)

fluoranthene-d10
2-methylnaphthalene-d10

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 33913 (ea.)

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes

SV Internal Standard Mix (6 components)

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
naphthalene-d8
perylene-d12
phenanthrene-d10

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31206	31206.15	31206.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31006	31006.15	31006.25

Revised SV Internal Standard Mix (7 components)

acenaphthene-d10
chrysene-d12
1,4-dichlorobenzene-d4
1,4-dioxane-d8
naphthalene-d8
perylene-d12
phenanthrene-d10

Each	15-pk.	25-pk.
2,000 µg/mL each in methylene chloride, 1 mL/ampul		
31885	31885.15	31885.25
4,000 µg/mL each in methylene chloride, 1 mL/ampul		
31886	31886.15	31886.25

Acid Surrogate Standard Mix (3/90 SOW) (4 components)

2-chlorophenol-d4
2-fluorophenol
phenol-d6
2,4,6-tribromophenol

1,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31003 (ea.)

7,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31073 (ea.)

7,500 µg/mL each in methanol, 5 mL/ampul
cat.# 31083 (ea.)

Acid Surrogate Mix (4/89 SOW) (3 components)

2-fluorophenol
phenol-d6
2,4,6-tribromophenol

Each	15-pk.	25-pk.
2,000 µg/mL each in methanol, 1 mL/ampul		
31025	31025.15	31025.25
10,000 µg/mL each in methanol, 1 mL/ampul		
31063	31063.15	31063.25
10,000 µg/mL each in methanol, 5 mL/ampul		
31087	31087.15	31087.25
10,000 µg/mL each in methanol, 10 mL/ampul		
33029	33029.15	33029.25

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes, *cont.*

Revised B/N Surrogate Mix (4 components)

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14
pyrene-d10

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31887	31887.15	31887.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31888	31888.15	31888.25
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31889	31889.15	31889.25

CLP 04.1 BNA Surrogate Mix (8 components)

2-chlorophenol-d4	1,500 µg/mL	nitrobenzene-d5	1,000
1,2-dichlorobenzene-d4	1,000	phenol-d6	1,500
2-fluorobiphenyl	1,000	*p*-terphenyl-d14	1,000
2-fluorophenol	1,500	2,4,6-tribromophenol	1,500

In methylene chloride, 1 mL/ampul
cat.# 31493 (ea.)

B/N Surrogate Standard Mix (3/90 SOW) (4 components)

1,2-dichlorobenzene-d4
2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31002 (ea.)

5,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31072 (ea.)

5,000 µg/mL each in methylene chloride, 5 mL/ampul
cat.# 31082 (ea.)

B/N Surrogate Mix (4/89 SOW) (3 components)

2-fluorobiphenyl
nitrobenzene-d5
p-terphenyl-d14

Each	15-pk.	25-pk.
1,000 µg/mL each in methylene chloride, 1 mL/ampul		
31024	31024.15	31024.25
5,000 µg/mL each in methylene chloride, 1 mL/ampul		
31062	31062.15	31062.25
5,000 µg/mL each in methylene chloride, 5 mL/ampul		
31086	31086.15	31086.25
5,000 µg/mL each in methylene chloride, 10 mL/ampul		
33028	33028.15	33028.25

Acid Matrix Spike Mix (5 components)

4-chloro-3-methylphenol
2-chlorophenol
4-nitrophenol
pentachlorophenol
phenol

1,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31005 (ea.)

7,500 µg/mL each in methanol, 1 mL/ampul
cat.# 31075 (ea.)

7,500 µg/mL each in methanol, 5 mL/ampul
cat.# 31085 (ea.)

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

04.2, 04.1, 4/89, and 3/90 SOW (Semivolatiles), QA Mixes, *cont.*

CLP 04.1 B/N Matrix Spike Mix (4 components)

acenaphthene
2,4-dinitrotoluene
N-nitroso-di-*n*-propylamine
pyrene

1,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31492 (ea.)

B/N Matrix Spike Mix (6 components)

acenaphthene
1,4-dichlorobenzene
2,4-dinitrotoluene
N-nitroso-di-*n*-propylamine
pyrene
1,2,4-trichlorobenzene

Each	15-pk.	25-pk.
1,000 µg/mL each in methanol, 1 mL/ampul		
31004	31004.15	31004.25
5,000 µg/mL each in methanol, 1 mL/ampul		
31074	31074.15	31074.25
5,000 µg/mL each in methanol, 5 mL/ampul		
31084	31084.15	31084.25
5,000 µg/mL each in methanol, 10 mL/ampul		
33030	33030.15	33030.25

Low-Concentration Semivolatiles, QA Mixes

SV Tuning Compound

decafluorotriphenylphosphine (DFTPP)

2,500 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31001 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

Neat, 1 g
cat.# 33027 (ea.)

No data pack available.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

SOM01.1 (Semivolatiles), Calibration Mixes

SOM01.1 SVOA MegaMix® Standard, Revised (65 components)

MEGAMIX®

acenaphthene
acenaphthylene
acetophenone
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl butyl phthalate
biphenyl
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether (2,2'-oxybis(1-chloropropane))
bis(2-ethylhexyl)phthalate
4-bromophenyl-phenylether
carbazole
4-chloroaniline
4-chloro-3-methylphenol
2-chloronaphthalene
2-chlorophenol
4-chlorophenyl-phenylether
chrysene
dibenzo(a,h)anthracene
dibenzofuran
3,3'-dichlorobenzidine
2,4-dichlorophenol
diethylphthalate
2,4-dimethylphenol
dimethylphthalate
di-*n*-butylphthalate
4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octyl phthalate
diphenylamine[1]
fluoranthene
fluorene
hexachlorobenzene
hexachloro-1,3-butadiene (hexachloro-butadiene)
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
2-methylnaphthalene
2-methylphenol (*o*-cresol)
3-methylphenol (*m*-cresol)*
4-methylphenol (*p*-cresol)*
naphthalene
2-nitroaniline
3-nitroaniline
4-nitroaniline
nitrobenzene
2-nitrophenol
4-nitrophenol
N-nitroso-di-*n*-propylamine
pentachlorophenol
phenanthrene
phenol
pyrene
1,2,4,5-tetrachlorobenzene
2,3,4,6-tetrachlorophenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31900 (ea.)

*3-methylphenol and 4-methylphenol concentration is 500 µg/mL.
[1] N-nitrosodiphenylamine (CLP-listed analyte) decomposes to diphenylamine (mix component) in the injector.

CLP/SVOA Additions Mix (3 components)

atrazine
benzaldehyde
ε-caprolactam

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31902 (ea.)

SOM01.1 SVOA MegaMix® Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
31900: SOM01.1 SVOA MegaMix Standard, Revised
31902: CLP/SVOA Additions Mix

cat.# 31904 (kit) kit

also available

Rxi®-5Sil MS Capillary Columns
Ideal for semivolatiles analysis
See **pages 32–33** for details.

04.2 and 04.1 (Semivolatiles), Calibration Mixes

CLP 04.1 B/N MegaMix® Standard, Revision 2 (47 components)

MEGAMIX®

acenaphthene
acenaphthylene
acetophenone
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
benzyl butyl phthalate
biphenyl
bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether (2,2'-oxybis(1-chloropropane))
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
carbazole
4-chloroaniline
2-chloronaphthalene
4-chlorophenyl phenyl ether
chrysene
dibenzo(a,h)anthracene
dibenzofuran
diethylphthalate
dimethylphthalate
di-*n*-butyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
di-*n*-octyl phthalate
diphenylamine[1]
fluoranthene
fluorene
hexachlorobenzene
hexachloro-1,3-butadiene (hexachloro-butadiene)
hexachlorocyclopentadiene
hexachloroethane
indeno(1,2,3-cd)pyrene
isophorone
2-methylnaphthalene
naphthalene
2-nitroaniline
3-nitroaniline
4-nitroaniline
nitrobenzene
N-nitroso-di-*n*-propylamine
phenanthrene
pyrene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31903 (ea.)

[1] N-nitrosodiphenylamine (CLP-listed analyte) decomposes to diphenylamine (mix component) in the injector.

CLP/SVOA Additions Mix (3 components)

atrazine
benzaldehyde
ε-caprolactam

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31902 (ea.)

CLP 04.1 B/N MegaMix® Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
31903: CLP 04.1 B/N MegaMix Standard, Revision 2
31902: CLP/SVOA Additions Mix

cat.# 31905 (kit) kit

tech tip

CLP Semivolatiles Dilution Tip

Atrazine and benzaldehyde react quickly with the methanol stabilizer used in most brands and grades of methylene chloride. This reaction will prevent you from obtaining stable, working-level calibration standards. We prepare our CLP semivolatiles standards from methylene chloride that is stabilized with amylene and is completely free of methanol. We strongly recommend screening the methylene chloride used to dilute these mixtures and confirming that it is free of methanol.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

04.2 and 04.1 (Semivolatiles), Calibration Mixes, *cont.*

CLP 04.1 Phenols Calibration Mix (14 components)

4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2,4-dinitrophenol
2-methyl-4,6-dinitrophenol
2-methylphenol
4-methylphenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31494 (ea.)

Benzidine Mix (2 components)

benzidine
3,3'-dichlorobenzidine

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

4/89 and 3/90 SOW (Semivolatiles), Calibration Mixes

SV Calibration Mix #1 (5 components)

benzyl alcohol
4-chloroaniline
2-nitroaniline
3-nitroaniline
4-nitroaniline

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31007 (ea.)

SV Calibration Mix #2 (15 components)

benzoic acid
4-chloro-3-methylphenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2,4-dinitrophenol
2-methyl-4,6-dinitrophenol
2-methylphenol
4-methylphenol
2-nitrophenol
4-nitrophenol
pentachlorophenol
phenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31008 (ea.)

SV Calibration Mix #3 (14 components)

bis(2-chloroethoxy)methane
bis(2-chloroethyl)ether
bis(2-chloroisopropyl)ether
bis(2-ethylhexyl)phthalate
4-bromophenyl phenyl ether
butyl benzyl phthalate
2-chloronaphthalene
4-chlorophenyl phenyl ether
dimethylphthalate
di-*n*-butylphthalate
di-*n*-octylphthalate
N-nitrosodimethylamine
N-nitroso-di-*n*-propylamine
N-nitrosodiphenylamine

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31009 (ea.)

4/89 and 3/90 SOW (Semivolatiles), Calibration Mixes, *cont.*

SV Calibration Mix #4 (13 components)

carbazole
dibenzofuran
diethyl phthalate
2,4-dinitrotoluene
2,6-dinitrotoluene
hexachlorobenzene
hexachlorobutadiene
hexachlorocyclopentadiene
hexachloroethane
isophorone
2-methylnaphthalene
nitrobenzene
1,2,4-trichlorobenzene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31010 (ea.)

SV Calibration Mix #5 / 610 PAH Mix (16 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31011 (ea.)

SV Calibration Mix #6 (18 components)

aldrin
α-BHC
β-BHC
δ-BHC
γ-BHC (lindane)
4,4'-DDD
4,4'-DDE
4,4'-DDT
dieldrin
endosulfan I
endosulfan II
endosulfan sulfate
endrin
endrin aldehyde
endrin ketone
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000 µg/mL each in toluene:hexane (1:1), 1 mL/ampul
cat.# 31012 (ea.)

SV Calibration Mix #7 (3 components)

1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31013 (ea.)

3,3'-Dichlorobenzidine

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 31026 (ea.)

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31835 (ea.)

605 Benzidines Calibration Mix (2 components)

benzidine
3,3'-dichlorobenzidine

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31030 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31834 (ea.)

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

4/89 and 3/90 SOW (Semivolatiles), Calibration Mixes, *cont.*

8270 Benzidines Mix (3 components)

benzidine
3,3'-dichlorobenzidine
3,3'-dimethylbenzidine

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31688 (ea.)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31852 (ea.)

CLP Semivolatile Calibration Kit #2 (without pesticides)

Contains 1 mL each of these mixtures.
31007: SV Calibration Mix #1 (anilines)
31008: SV Calibration Mix #2 (phenols)
31009: SV Calibration Mix #3 (base neutrals)
31010: SV Calibration Mix #4 (base neturals)
31011: SV Calibration Mix #5 (PAHs)
31013: SV Calibration Mix #7 (dichlorobenzenes)
31026: 3,3'-dichlorobenzidine

cat.# 31462 (kit) **kit**

Semivolatile Calibration Kit #3 (with benzidine)

Contains 1 mL each of these mixtures.
31007: SV Calibration Mix #1 (anilines)
31008: SV Calibration Mix #2 (phenols)
31009: SV Calibration Mix #3 (base neutrals)
31010: SV Calibration Mix #4 (base neturals)
31011: SV Calibration Mix #5 (PAHs)
31013: SV Calibration Mix #7 (dichlorobenzenes)
31030: 605 Benzidines Calibration Mix (benzidine & 3,3'-dichlorobenzidine)

cat.# 31463 (kit) **kit**

03.2 (Semivolatiles), Calibration Mixes

OLC 03.2 SVOA Deuterated Monitoring Compounds (DMC) (16 components)

acenaphthylene-d8
anthracene-d10
benzo(a)pyrene-d12
4-chloroaniline-d4
bis-(2-chloroethyl)ether-d8
2-chlorophenol-d4
2,4-dichlorophenol-d3
dimethylphthalate-d6
4,6-dinitro-methylphenol-d2
fluorene-d10
4-methylphenol-d8
nitrobenzene-d5
2-nitrophenol-d4
4-nitrophenol-d4
phenol-d5
pyrene-d10

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31810 (ea.)

Fortification Mix (7 components)

4,6-dinitro-2-methylphenol
2,4-dinitrophenol
2-nitroaniline
3-nitroaniline
4-nitroaniline
4-nitrophenol
2,4,5-trichlorophenol

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31813 (ea.)

03.2 (Semivolatiles), Calibration Mixes, *cont.*

3,3'-Dichlorobenzidine

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31835 (ea.)

Hexachlorophene

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31811 (ea.)

Low-Concentration Semivolatiles, Calibration Mixes

L/C Phenol Mix A (6 components)

2,4-dinitrophenol
2-methyl-4,6-dinitrophenol
4-nitrophenol
pentachlorophenol
2,4,6-tribromophenol (SS)
2,4,5-trichlorophenol

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31208 (ea.)

Must be calibrated at a level different from the other listed semivolatile compounds.

L/C Aniline Mix A (3 components)

2-nitroaniline
3-nitroaniline
4-nitroaniline

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31210 (ea.)

Must be calibrated at a level different from the other listed semivolatile compounds.

L/C Aniline Mix B

4-chloroaniline

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31211 (ea.)

Additional Required Low-Concentration Semivolatile Mixes:

31024:	B/N Surrogate Mix (4/89 SOW)	page 475
31009:	SV Calibration Mix #3	page 506
31010:	SV Calibration Mix #4	page 506
31011:	SV Calibration Mix #5	page 473
31026:	3,3'-dichlorobenzidine	page 442
31001:	SV Tuning Compound (DFTPP)	page 442

Note: Pesticides are not included in the EPA CLP semivolatile analytical method.

Semivolatile Organics/Base, Neutral & Acid Extractables (BNAs), *cont.*

GPC Calibration Mix

Qualitative mixture useful for determining GPC dump/collect times. The compounds are dissolved in methylene chloride at the concentrations listed.

CLP GPC Calibration Mix (5 components)

bis(2-ethylhexyl) phthalate	10 mg/mL	perylene	0.2
corn oil	250	sulfur	0.8
methoxychlor	2.0		

In methylene chloride, 1 mL/ampul
cat.# 32019 (ea.)

In methylene chloride, 5 mL/ampul
cat.# 32023 (ea.)

No data pack available.

Revised GPC Calibration Mix (5 components)

bis(2-ethylhexyl) phthalate	5 mg/mL	perylene	0.2
corn oil	250	sulfur	0.8
methoxychlor	1.0		

In methylene chloride, 1 mL/ampul
cat.# 32041 (ea.)

In methylene chloride, 5 mL/ampul
cat.# 32042 (ea.)

No data pack available.

did you know?

Our **Pesticide Matrix Spike Mix** (cat.# 32018, **page 488**) can be used as a GPC calibration verification solution.

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Toxicity Characteristic Leaching Procedure (TCLP)

Method 1311 (Toxicity Characteristic Leaching Procedure [TCLP])

TCLP VOA Mix (11 components)

benzene
2-butanone (MEK)
carbon tetrachloride
chlorobenzene
chloroform
1,4-dichlorobenzene
1,2-dichloroethane
1,1-dichloroethene
tetrachloroethene
trichloroethene
vinyl chloride

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30024 (ea.)

TCLP Acid Mix (6 components)

2-methylphenol
3-methylphenol
4-methylphenol
pentachlorophenol
2,4,5-trichlorophenol
2,4,6-trichlorophenol

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 31027 (ea.)

TCLP B/N Mix (7 components)

1,4-dichlorobenzene
2,4-dinitrotoluene
hexachlorobenzene
hexachlorobutadiene
hexachloroethane
nitrobenzene
pyridine

2,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31028 (ea.)

TCLP Pesticide Mix (5 components)

γ-BHC (lindane)
endrin
heptachlor
heptachlor epoxide (isomer B)
methoxychlor

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32013 (ea.)

TCLP Herbicide Mix (2 components)

2,4-D (free acid)
Silvex (free acid)

2,000 µg/mL each in methanol, 1 mL/ampul
cat.# 32014 (ea.)

TCLP Toxaphene Mix

toxaphene

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32015 (ea.)

TCLP Chlordane Mix

chlordane

2,000 µg/mL in methanol, 1 mL/ampul
cat.# 32016 (ea.)

Trihalomethanes

Method 501.1, 501.2, 501.3 (Trihalomethanes)

501 Trihalomethane Mix (4 components)

bromodichloromethane
bromoform
chloroform
dibromochloromethane

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30036 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30211 (ea.)

DW-VOC Mix #1 (8 components)

benzene
carbon tetrachloride
1,4-dichlorobenzene
1,2-dichloroethane
1,1-dichloroethene
1,1,1-trichloroethane
trichloroethene
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30037 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30219 (ea.)

DW-VOC Mix #2 (12 components)

chlorobenzene
1,2-dichlorobenzene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
ethylbenzene
styrene
tetrachloroethene
toluene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30038 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30220 (ea.)

DW-VOC Mix #3 (3 components)

methylene chloride
1,2,4-trichlorobenzene
1,1,2-trichloroethane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30235 (ea.)

DW-VOC Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30211: 501 Trihalomethane Mix
30219: DW-VOC Mix #1
30220: DW-VOC Mix #2
30235: DW-VOC Mix #3

cat.# 30221 (kit) kit

Technical Service

Do you have a technical question? Restek's Technical Service group has answers! Drawing from our extensive libraries of technical information and many years of collective chromatography experience, the experts in Technical Service can help you with everything from setup to method development.

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For quick answers to commonly asked questions any time of the day, visit **www.restek.com/answers** or contact us directly:

In the U.S.

Phone: 1-800-356-1688, ext. 4
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Monday - Thursday, 8:00 a.m. to 6:00 p.m.
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Volatile Organics

Individual VOA Surrogate and Internal Standards for EPA Methods

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
benzene-d6	1076-43-3	PTM	2,000	30025
2-bromochlorobenzene	694-80-4	PTM	2,000	30228
4-bromochlorobenzene	106-39-8	PTM	2,000	30230
bromochloromethane	74-97-5	PTM	2,000	30225
2-bromo-1-chloropropane	3017-95-6	PTM	2,000	30226
4-bromofluorobenzene	460-00-4	PTM	2,000	30026
chlorobenzene-d5	3114-55-4	PTM	2,000	30223
1-chloro-2-fluorobenzene	348-51-6	PTM	2,000	30040
1,2-dichlorobenzene-d4	2199-69-1	PTM	2,000	30049
1,4-dichlorobutane	110-56-5	PTM	2,000	30227
1,2-dichloroethane-d4	17060-07-0	PTM	2,000	30027
1,4-difluorobenzene	540-36-3	PTM	2,000	30032
ethylbenzene-d5	20302-26-5	PTM	2,000	30028
ethylbenzene-d10	25837-05-2	PTM	2,000	30029
fluorobenzene	462-06-6	PTM	2,000	30030
pentafluorobenzene	363-72-4	PTM	2,000	30031
toluene-d8	2037-26-5	PTM	2,000	30224
α,α,α-trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

Method 501.1, 501.2, 501.3 (Trihalomethanes)

See page 509.

Antifoam Agent for Purge-and-Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap—and possibly the GC column. Our silica-containing antifoam agent is effective over a wide pH range and will not conflict with chromatography of target analytes. To use properly, see the instructions on the product certificate or on the product page (search "31822" at www.restek.com).

Neat, 1 mL/ampul

cat.# 31822 (ea.)

No data pack available.

Method 502.1, 502.2 (Volatile Halogenated Organics)

502.2 Internal Standard #1

1-chloro-2-fluorobenzene

2,000 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30040 (ea.)

502.2 Internal Standard Mix #2 (2 components)

2-bromo-1-chloropropane
fluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30041 (ea.)

8021/502.2 Surrogate Mix #1 (3 components)

1-bromo-2-chloroethane
1-chloro-3-fluorobenzene
fluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30463 (ea.)

Volatiles MegaMix® Standard With Gases

MEGAMIX®

(60 components)

benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
bromomethane (methyl bromide)
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroethane (ethyl chloride)
chloroform
chloromethane (methyl chloride)
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
dichlorodifluoromethane (CFC-12)
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methylene chloride (dichloromethane)
naphthalene
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane (CFC-11)
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30603 (ea.)

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Volatile Organics

Method 502.1, 502.2 (Volatile Halogenated Organics), *cont.*

502.2 MegaMix® Standard (54 components)

MEGAMIX®

Includes all target analytes except the six gases, which are available separately as 502.2 Calibration Mix #1 (below).

benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroform
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methylene chloride (dichloromethane)
naphthalene
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30432 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30431 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

502.2 Calibration Mix #2 (14 components)

bromodichloromethane
bromoform
carbon tetrachloride
chloroform
1,1-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,3-dichloropropane
2,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
1,1,1-trichloroethane
trichloroethene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30043 (ea.)

502.2 Calibration Mix #3 (14 components)

bromochloromethane
dibromochloromethane
1,2-dibromo-3-chloropropane
1,2-dibromoethane
dibromomethane
1,2-dichloroethane
cis-1,2-dichloroethene
1,2-dichloropropane
1,1-dichloropropene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,2-trichloroethane
1,2,3-trichloropropane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30044 (ea.)

502.2 Calibration Mix #4 (9 components)

benzene
tert-butylbenzene
chlorobenzene
isopropylbenzene
n-propylbenzene
styrene
toluene
1,3,5-trimethylbenzene
m-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30045 (ea.)

502.2 Calibration Mix #5 (10 components)

bromobenzene
n-butylbenzene
sec-butylbenzene
2-chlorotoluene
1,3-dichlorobenzene
ethylbenzene
1,2,4-trichlorobenzene
1,2,4-trimethylbenzene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30046 (ea.)

502.2 Calibration Mix #6 (7 components)

4-chlorotoluene
1,2-dichlorobenzene
1,4-dichlorobenzene
hexachlorobutadiene
4-isopropyltoluene
naphthalene
1,2,3-trichlorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30047 (ea.)

502.2 VOA Calibration Kit #1 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6

cat.# 30444 (kit) kit

502.2 VOA Calibration Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30431: 502.2 MegaMix Standard

cat.# 30445 (kit) kit

502.2 VOA Calibration Kit #3 (200 µg/mL)

Contains 1 mL each of these mixtures.
30439: 502.2 Calibration Mix #1
30432: 502.2 MegaMix Standard

cat.# 30446 (kit) kit

Volatile Organics, *cont.*

Method 504.1 (Ethylene Dibromide/ Dibromochloropropane)

504.1 Calibration Mix (3 components)

1,2-dibromo-3-chloropropane
1,2-dibromoethane
1,2,3-trichloropropane

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30239 (ea.)

Method 522 (1,4-Dioxane)

See page 481.

Method 524.1, 524.2 (Volatile Organics)

524 Internal Standard/Surrogate Mix (3 components)

4-bromofluorobenzene
1,2-dichlorobenzene-d4
fluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30201 (ea.)

Surrogate Standard (2 components)

4-bromofluorobenzene
α,α,α-trifluorotoluene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30484 (ea.)

524.2 Surrogate Standard (2 components)

1-bromo-4-fluorobenzene
1,2-dichlorobenzene-d4

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30607 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

Neat, 1 g
cat.# 33027 (ea.)

No data pack available.

Antifoam Agent for Purge-and-Trap Samples

Foam generated as purge gas passes through a sample can enter the analytical trap—and possibly the GC column. Our silica-containing antifoam agent is effective over a wide pH range and will not conflict with chromatography of target analytes. To use properly, see the instructions on the product certificate or on the product page (search "31822" at www.restek.com).

Neat, 1 mL/ampul
cat.# 31822 (ea.)

No data pack available.

Method 524.1, 524.2 (Volatile Organics), *cont.*

Volatiles MegaMix® Standard With Gases (60 components)

MEGAMIX®

benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
bromomethane (methyl bromide)
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon tetrachloride
chlorobenzene
chloroethane (ethyl chloride)
chloroform
chloromethane (methyl chloride)
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
dichlorodifluoromethane (CFC-12)
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
hexachloro-1,3-butadiene (hexachlorobutadiene)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methylene chloride (dichloromethane)
naphthalene
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
trichlorofluoromethane (CFC-11)
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
vinyl chloride
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30603 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

Ketones Mix, 524.2 Rev. 4.1 (5 components)

acetone
2-butanone (MEK)
1,1-dichloro-2-propanone
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30602 (ea.)

Oxygenates Standard (5 components)

diisopropyl ether (DIPE)	2,000 µg/mL	*tert*-amyl methyl ether (TAME)	2,000
ethyl-*tert*-butyl ether (ETBE)	2,000	*tert*-butyl alcohol (TBA)	10,000
tert-amyl ethyl ether (TAEE)	2,000		

In P&T methanol, 1 mL/ampul
cat.# 30619 (ea.)

Volatile Organics, *cont.*

Method 524.1, 524.2 (Volatile Organics), *cont.*

Drinking Water VOA MegaMix® Standard, 524.2 Rev. 4.1 (73 components)

MEGAMIX®

acrylonitrile
allyl chloride
benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon disulfide
carbon tetrachloride
chloroacetonitrile
chlorobenzene
1-chlorobutane
chlorodibromomethane (dibromochloromethane)
chloroform
2-chlorotoluene
4-chlorotoluene
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (ethylene dibromide)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
trans-1,4-dichloro-2-butene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
diethyl ether (ethyl ether)
ethylbenzene
ethyl methacrylate
hexachloro-1,3-butadiene
hexachloroethane
iodomethane (methyl iodide)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methacrylonitrile
methyl acrylate
methyl *tert*-butyl ether (MTBE)
methylene chloride (dichloromethane)
methyl methacrylate
naphthalene
nitrobenzene
2-nitropropane
pentachloroethane
propionitrile (ethylcyanide)
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
tetrahydrofuran
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30601 (ea.)

524 Calibration Mix #7A (5 components)

acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)
tetrahydrofuran

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30300 (ea.)

524 Calibration Mix #7B (7 components)

acrylonitrile
allyl chloride (3-chloropropene)
ethyl methacrylate
methyl acrylate
methyl methacrylate
nitrobenzene
pentachloroethane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30304 (ea.)

524 Calibration Mix #7 Kit

Contains 1 mL each of these mixtures.
30300: 524 Calibration Mix #7A
30304: 524 Calibration Mix #7B

cat.# 30202 (kit) kit

524 Calibration Mix #8 (12 components)

carbon disulfide
chloroacetonitrile
1-chlorobutane
trans-1,4-dichloro-2-butene
1,1-dichloro-2-propanone
diethyl ether
hexachloroethane
iodomethane (methyl iodide)
methacrylonitrile
methyl *tert*-butyl ether
2-nitropropane
propionitrile

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30203 (ea.)

524 Rev. 4.0 Volatile Organics Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30201: 524 Internal Standard/Surrogate Mix
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30300: 524 Calibration Mix #7A
30304: 524 Calibration Mix #7B
30203: 524 Calibration Mix #8

cat.# 30204 (kit) kit

524 Rev. 4.0 VOA Kit #2 (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30431: 502.2 MegaMix Standard
30300: 524 Calibration Mix #7A
30304: 524 Calibration Mix #7B
30203: 524 Calibration Mix #8
30201: 524 Surrogate/Internal Standard Mix

cat.# 30447 (kit) kit

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Volatile Organics, *cont.*

Method 524.3 (Purgeable Organics in Drinking Water)

UCMR3 Method 524.3 Standard (9 components)

bromochloromethane	600 µg/mL	chloromethane	2,000
bromomethane	2,000	1,1-dichloroethane	300
1,3-butadiene	1,000	*n*-propylbenzene	300
sec-butylbenzene	400	1,2,3-trichloropropane	300
chlorodifluoromethane (CFC-22)	800		

In P&T methanol, 1 mL/ampul

cat.# 30642 (ea.)

NEW!

EPA 524.3 Reference Standards

- Full 82-component EPA 524.3 list using as few as three ampuls—reduce prep time and chances for error or contamination.
- EPA 524.3 VOA MegaMix® ampul includes oxygenates group—no need to order separately.
- Volatile gases prepared separately—replace shorter-life components without wasting money on full list.
- Two options for internal and surrogate standards—separate or combined mix.
- Certified reference materials (CRMs) manufactured and QC-tested in Restek's ISO-accredited labs—satisfy your ISO requirements.
- Also ideal for surface water and groundwater testing.

In support of the U.S. Safe Drinking Water Act (SDWA), Restek offers a complete set of EPA 524.3 reference standards for the monitoring of purgeable organic compounds in drinking water—using as few as three ampuls! In addition, this collection of certified reference materials (CRMs) also covers the seven volatile organic compounds (VOCs) included in the Unregulated Contaminant Monitoring Rule 3 (UCMR3), which requires monitoring of all public drinking water systems with 10,000 or more customers.

524.3 VOA MegaMix® Standard

MEGAMIX®

(69 components)

allyl chloride (3-chloropropene)
tert-amyl ethyl ether (TAEE)
tert-amyl methyl ether (TAME)
benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
tert-butanol (TBA)
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon disulfide
carbon tetrachloride
chlorobenzene
chloroform
1-chlorobutane (butyl chloride)
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane
dibromomethane
1,2-dibromoethane (EDB)
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
diethyl ether (ethyl ether)
diisopropyl ether (DIPE)
ethylbenzene
ethyl-*tert*-butyl ether (ETBE)
ethyl methacrylate
hexachlorobutadiene
hexachloroethane
iodomethane (methyl iodide)
isopropylbenzene (cumene)
4-isopropyltoluene (*p*-cymene)
methyl acetate
methyl-*tert*-butyl ether (MTBE)
methylene chloride (dichloromethane)
naphthalene
pentachloroethane
n-propylbenzene
styrene
tetrachloroethene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrahydrofuran
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,3-trichloropropane
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30013 (ea.)

NEW!

524.3 Gas Calibration Mix (7 components)

bromomethane (methyl bromide)
1,3-butadiene
chlorodifluoromethane (CFC-22)
chloromethane (methyl chloride)
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30014 (ea.)

NEW!

524.3 Internal Standard Mix (3 components)

chlorobenzene-d5
1,4-dichlorobenzene-d4
1,4-difluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30015 (ea.)

NEW!

524.3 Surrogate Standard (3 components)

1-bromo-4-fluorobenzene (BFB)
methyl-d3-*tert*-butyl ether
1,2-dichlorobenzene-d4

2,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 30016 (ea.)

NEW!

524.3 Internal Standard/Surrogate Mix (6 components)

1-bromo-4-fluorobenzene (BFB)
methyl-d3-*tert*-butyl ether
chlorobenzene-d5
1,2-dichlorobenzene-d4
1,4-dichlorobenzene-d4
1,4-difluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul

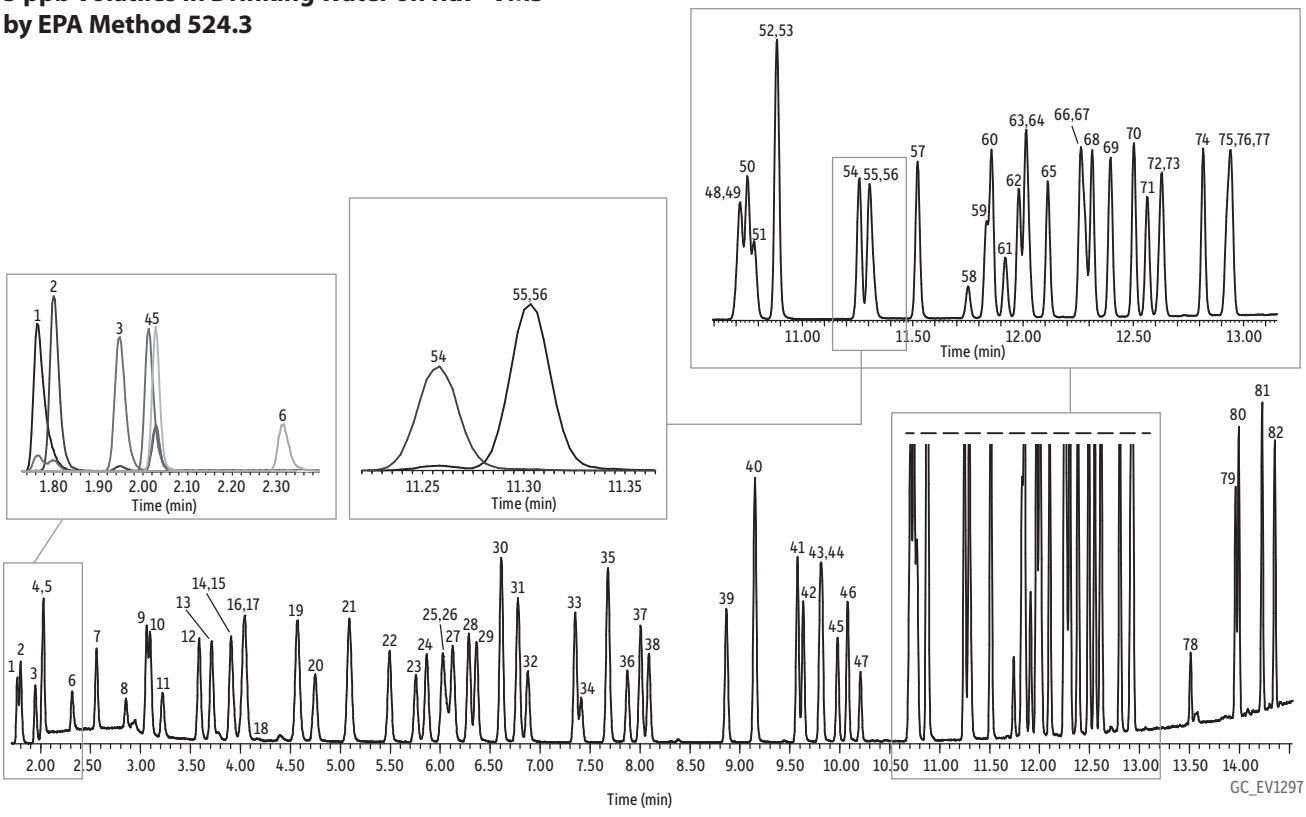
cat.# 30017 (ea.)

NEW!

Volatile Organics, *cont.*

Method 524.3 (Purgeable Organics in Drinking Water), *cont.*

5 ppb Volatiles in Drinking Water on Rtx®-VMS by EPA Method 524.3



Column	Rtx®-VMS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 19915)
Sample	524.3 internal standard/surrogate mix (cat.# 30017) 524.3 gas calibration mix (cat.# 30014) 524.3 VOA MegaMix® standard (cat.# 30013)
Diluent:	RO water
Conc.:	5 ng/mL (5 mL sample)
Injection	purge and trap split (split ratio 30:1)
Liner:	Sky® 1.0mm ID straight inlet liner (cat.# 23333.1)
Inj. Temp.:	200 °C
Purge and Trap	
Instrument:	EST Encon Evolution
Trap Type:	Vocarb 3000
Purge:	11 min, flow 40 mL/min
Dry Purge:	1 min, flow 50 mL/min
Desorb:	1 min @ 260 °C, flow 30.9 mL/min
Bake:	8 min @ 265 °C
Interface Connection:	injection port
Transfer Line Temp.:	150 °C
Oven	
Oven Temp:	45 °C (hold 4.5 min) to 100 °C at 12 °C/min to 240 °C at 25 °C/min (hold 1.32 min)
Carrier Gas	He, constant flow
Flow Rate:	0.9 mL/min
Detector	MS
Mode:	Scan

Scan Program:

Group	Start Time (min)	Scan Range (amu)	Scan Rate (scans/sec)
1	1.5	47–300	5.4
2	2.9	35–300	5.19

Transfer Line Temp.:	240 °C
Analyzer Type:	Quadrupole
Source Temp.:	230 °C
Quad Temp.:	150 °C
Electron Energy:	70 eV
Solvent Delay Time:	1.5 min
Tune Type:	BFB
Ionization Mode:	EI
Instrument	Agilent 7890A GC & 5975C MSD
Acknowledgement	EST Analytical provided the Centurion robotic autosampler and Encon Evolution P&T concentrator.

Peaks

1. Dichlorodifluoromethane
2. Chlorodifluoromethane
3. Chloromethane
4. Vinyl chloride
5. 1,3-Butadiene
6. Bromomethane
7. Trichlorofluoromethane
8. Diethyl ether
9. 1,1-Dichloroethene
10. Carbon disulfide
11. Methyl iodide
12. Allyl chloride
13. Methylene chloride
14. *trans*-1,2-Dichloroethene
15. Methyl acetate
16. MTBE-d3 (SS)
17. MTBE
18. *tert*-Butyl alcohol (TBA)
19. Diisopropyl ether (DIPE)
20. 1,1-Dichloroethane
21. *tert*-Butyl ethyl ether (ETBE)
22. *cis*-1,2-Dichloroethene
23. Bromochloromethane
24. Chloroform
25. Carbon tetrachloride
26. Tetrahydrofuran
27. 1,1,1-Trichloroethane
28. 1,1-Dichloropropene
29. 1-Chlorobutane
30. Benzene
31. *tert*-Amyl methyl ether (TAME)
32. 1,2-Dichloroethane
33. Trichloroethene
34. 1,4-Difluorobenzene
35. *tert*-Amyl ethyl ether (TAEE)
36. Dibromomethane
37. 1,2-Dichloropropane
38. Bromodichloromethane
39. *cis*-1,3-Dichloropropene
40. Toluene
41. Tetrachloroethene
42. *trans*-1,3-Dichloropropene
43. 1,1,2-Trichloroethane
44. Ethyl methacrylate
45. Dibromochloromethane
46. 1,3-Dichloropropane
47. 1,2-Dibromoethane
48. Chlorobenzene-d5
49. Chlorobenzene
50. Ethylbenzene
51. 1,1,1,2-Tetrachloroethane
52. *m*-Xylene
53. *p*-Xylene
54. *o*-Xylene
55. Styrene
56. Bromoform
57. Isopropylbenzene
58. 4-Bromofluorobenzene (SS)
59. Bromobenzene
60. *n*-Propylbenzene
61. 1,1,2,2-Tetrachloroethane
62. 2-Chlorotoluene
63. 1,3,5-Trimethylbenzene
64. 1,2,3-Trichloropropane
65. 4-Chlorotoluene
66. *tert*-Butylbenzene
67. Pentachloroethane
68. 1,2,4-Trimethylbenzene
69. *sec*-Butylbenzene
70. 4-Isopropyltoluene
71. 1,3-Dichlorobenzene
72. 1,4-Dichlorobenzene-D4
73. 1,4-Dichlorobenzene
74. *n*-Butylbenzene
75. Hexachloroethane
76. 1,2-Dichlorobenzene-D4 (SS)
77. 1,2-Dichlorobenzene
78. 1,2-Dibromo-3-chloropropane
79. Hexachlorobutadiene
80. 1,2,4-Trichlorobenzene
81. Naphthalene
82. 1,2,3-Trichlorobenzene

Volatile Organics, *cont.*

Method 601 (Purgeable Hydrocarbons)

VOA Purgeable Halocarbon Mix #1 (23 components)

bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30212 (ea.)

Method 602 (Purgeable Aromatics)

602 Purgeable Aromatics Calibration Mix (7 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
toluene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30035 (ea.)

Method 603 (Acrolein/Acrylonitrile)

Acrolein/Acrylonitrile (2 components)

acrolein
acrylonitrile

2,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30600 (ea.)

Must ship overnight on ice.
This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrolein

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

Acrylonitrile

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30246 (ea.)

Method 624 (Purgeable Halocarbons)

Volatiles MegaMix® Standard, EPA Method 624 (26 components)

MEGAMIX®

benzene
bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30497 (ea.)

624 Internal Standard Mix (3 components)

bromochloromethane
2-bromo-1-chloropropane
1,4-dichlorobutane

1,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30023 (ea.)

624 Surrogate Standard Mix (3 components)

4-bromofluorobenzene
fluorobenzene
pentafluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30243 (ea.)

Surrogate Standard (2 components)

4-bromofluorobenzene
α,α,α-trifluorotoluene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30484 (ea.)

624 Calibration Mix #1 (gases) (5 components)

bromomethane
chloroethane
chloromethane
trichlorofluoromethane (CFC-11)
vinyl chloride

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30020 (ea.)

624 Calibration Mix #2 (12 components)

benzene
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
dibromochloromethane
1,1-dichloroethane
1,1-dichloroethene
1,2-dichloropropane
methylene chloride
tetrachloroethene
1,1,2-trichloroethane
trichloroethene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30021 (ea.)

Volatile Organics, *cont.*

Method 624 (Purgeable Halocarbons), *cont.*

624 Calibration Mix #3 (14 components)

bromodichloromethane
bromoform
chloroform
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,2-dichloroethane
trans-1,2-dichloroethene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
1,1,2,2-tetrachloroethane
toluene
1,1,1-trichloroethane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30022 (ea.)

624 Complete Kit

Contains 1 mL each of these mixtures.
30020: 624 Calibration Mix #1
30021: 624 Calibration Mix #2
30022: 624 Calibration Mix #3
30023: 624 Internal Standard Mix
30243: 624 Surrogate Standard Mix

cat.# 30244 (kit) **kit**

624 Kit

Contains 1 mL each of these mixtures.
30020: 624 Calibration Mix #1
30021: 624 Calibration Mix #2
30022: 624 Calibration Mix #3
30023: 624 Internal Standard Mix

cat.# 30055 (kit) **kit**

Method 8010 (Halogenated Volatile Organics)

624 Internal Standard Mix (3 components)

bromochloromethane
2-bromo-1-chloropropane
1,4-dichlorobutane

1,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30023 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

also available

Gas Regulators

See **pages 279–281.**

Method 8010 (Halogenated Volatile Organics), *cont.*

BTEX Standard (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

tech tip

To analyze compounds listed in Methods 8010 and 8020 concurrently, add BTEX standard to the calibration curve mix.

BTEX Gas Mix (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde)
104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas
@ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide)
110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas
@ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi **NEW!**
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi **NEW!**
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Volatile Organics, *cont.*

Method 8011 (1,2-Dibromoethane, 1,2-Dibromo-3-chloropropane)

8011 Calibration Mix—EDB/DBCP (2 components)

1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30062 (ea.)

Method 8020 (Aromatic Volatile Organics)

Internal and Surrogate Standards for Method 8020

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-bromofluorobenzene	460-00-4	PTM	2,000	30026
1,4-difluorobenzene	540-36-3	PTM	2,000	30032
fluorobenzene	462-06-6	PTM	2,000	30030
α,α,α-trifluorotoluene	98-08-8	PTM	2,000	30048

PTM = Purge-and-trap grade methanol

8020A Calibration Mix (10 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30222 (ea.)

Method 8021 (Volatile Organics)

502.2 Internal Standard Mix #2 (2 components)

2-bromo-1-chloropropane
fluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30041 (ea.)

8021/502.2 Surrogate Mix #1 (3 components)

1-bromo-2-chloroethane
1-chloro-3-fluorobenzene
fluorobenzene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30463 (ea.)

Method 8240 (Volatile Organic Compounds [VOCs])

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

VOA Calibration Mix #1 (ketones) (4 components)

acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30006 (ea.)

VOA Purgeable Halocarbon Mix #1 (23 components)

bromodichloromethane
bromoform
carbon tetrachloride
chlorobenzene
2-chloroethyl vinyl ether
chloroform
dibromochloromethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
methylene chloride
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30212 (ea.)

8240 Volatiles Mix #1A (12 components)

allyl chloride
benzyl chloride
1,2-dibromo-3-chloropropane
1,2-dibromoethane
dibromomethane
cis-1,4-dichloro-2-butene
trans-1,4-dichloro-2-butene
1,4-dioxane
iodomethane
pentachloroethane
1,1,1,2-tetrachloroethane
1,2,3-trichloropropane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30217 (ea.)

8240 Volatiles Mix #2A (3 components)

carbon disulfide
2-picoline
pyridine

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30218 (ea.)

restek innovation!

Xylene-Free, Highly Purified Chloroprene Standard

The R&D chemists at Restek developed a novel procedure that produces a pure, quantitative chloroprene solution specially stabilized in purge-and-trap grade methanol. The entire procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene. The final solution is specially stabilized, allowing analysts to make dilutions for working standards in unmodified purge-and-trap grade methanol.

Note: Because chloroprene is not analyzed by many laboratories, it is not included in our 8240 VOA mixes. Chloroprene is included in our 8260B MegaMix® calibration mix. Refer to **page 520.**

Volatile Organics, *cont.*

Method 8240 (Volatile Organic Compounds [VOCs]), *cont.*

8240 Nitriles Mix (7 components)

acrylonitrile
ethyl methacrylate
malononitrile
methacrylonitrile
methyl methacrylate
propionitrile
styrene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30215 (ea.)

8240 Alcohols Mix (5 components)

allyl alcohol
2-chloroethanol
ethanol
isobutyl alcohol
propargyl alcohol

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30214 (ea.)

Glycols Standard (2 components)

ethylene glycol
propylene glycol

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

BTEX Standard (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

BTEX Gas Mix (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

cylinder design

Spectra (Linde) 104 L Cylinders:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

8260A Internal Standard Mix (3 components)

chlorobenzene-d5
1,4-dichlorobenzene-d4
fluorobenzene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30241 (ea.)

8260 Internal Standard Mix (4 components)

chlorobenzene-d5
1,4-dichlorobenzene-d4
1,4-difluorobenzene
pentafluorobenzene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30074 (ea.)

8260A Surrogate Mix (4 components)

4-bromofluorobenzene
dibromofluoromethane
1,2-dichloroethane-d4
toluene-d8

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30240 (ea.)

8260 Surrogate Mix (3 components)

4-bromofluorobenzene
dibromofluoromethane
toluene-d8

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30073 (ea.)

8260B Matrix Spike Mix (5 components)

benzene
chlorobenzene
1,1-dichloroethene
toluene
trichloroethylene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30479 (ea.)

8240/8260 System Performance Check Mix (5 components)

bromoform
chlorobenzene
chloromethane
1,1-dichloroethane
1,1,2,2-tetrachloroethane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30075 (ea.)

4-Bromofluorobenzene

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30067 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30082 (ea.)

1,4-Dioxane-d8

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30614 (ea.)

Volatile Organics, *cont.*

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

Neat, 1 g
cat.# 33027 (ea.)

No data pack available.

8260B MegaMix® Calibration Mix

MEGAMIX®

(76 components)

acetonitrile
acrylonitrile
allyl chloride
benzene
bromobenzene
bromochloromethane
bromodichloromethane
bromoform
n-butylbenzene
sec-butylbenzene
tert-butylbenzene
carbon disulfide
carbon tetrachloride
chlorobenzene
2-chloroethanol
chloroform
chloroprene
2-chlorotoluene
4-chlorotoluene
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
dibromomethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
cis-1,4-dichloro-2-butene
trans-1,4-dichloro-2-butene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
1,3-dichloropropane
2,2-dichloropropane
1,1-dichloropropene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
diethyl ether (ethyl ether)
1,4-dioxane
ethylbenzene
ethyl methacrylate
hexachloro-1,3-butadiene
iodomethane
isobutyl alcohol
isopropylbenzene (cumene)
4-isopropyl toluene (*p*-cymene)
methacrylonitrile
methyl acrylate
methyl methacrylate
methylene chloride (dichloromethane)
naphthalene
nitrobenzene
2-nitropropane
pentachloroethane
propionitrile
n-propylbenzene
styrene
1,1,1,2-tetrachloroethane
1,1,2,2-tetrachloroethane
tetrachloroethene
tetrahydrofuran
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,2,3-trichloropropane
1,1,2-trichlorotrifluororethane (CFC-113)
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30633 (ea.)

8260B MegaMix® calibration mix
also available without pentachloroethane (cat.# 30152).

2-Chloroethyl Vinyl Ether

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30265 (ea.)

8260B MegaMix® Calibration Mix Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
30633: 8260B MegaMix Calibration Mix
30265: 2-chlorethyl vinyl ether

cat.# 30475 (kit) kit

8240/8260 Calibration Check Mix (6 components)

chloroform
1,1-dichloroethene
1,2-dichloropropane
ethylbenzene
toluene
vinyl chloride

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30427 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

8260B Acetate Mix (5 components)

vinyl acetate
ethyl acetate
isopropyl acetate
n-propyl acetate
n-butyl acetate

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30477 (ea.)

8260B Acetate Mix (Revised) (7 components)

n-amyl acetate
butyl acetate
ethyl acetate
isopropyl acetate
methyl acetate
propyl acetate
vinyl acetate

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30489 (ea.)

California Oxygenates Mix (5 components)

diisopropyl ether (DIPE)	2,000 µg/mL	*tert*-butyl alcohol	10,000
ethyl-*tert*-butyl ether (ETBE)	2,000	methyl *tert*-butyl ether (MTBE)	2,000
tert-amyl methyl ether (TAME)	2,000		

In P&T methanol, 1 mL/ampul
cat.# 30465 (ea.)

Oxygenates (6 components)

tert-amyl ethyl ether (TAEE)	2,000 µg/mL	diisopropyl ether (DIPE)	2,000
tert-amyl methyl ether (TAME)	2,000	ethyl-*tert*-butyl ether (ETBE)	2,000
tert-butyl alcohol (TBA)	10,000	methyl *tert*-butyl ether (MTBE)	2,000

In P&T methanol, 1 mL/ampul
cat.# 30626 (ea.)

Volatile Organics, *cont.*

Method 8260, 8260A, 8260B (Volatile Organic Compounds [VOCs]), *cont.*

Single-Component Oxygenates Solutions

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
tert-amyl alcohol	75-85-4	PTM	10,000	30631
tert-amyl ethyl ether (TAEE)	919-94-8	PTM	2,000	30617
tert-amyl methyl ether (TAME)	994-05-8	PTM	2,000	30629
tert-butanol	75-65-0	PTM	50,000	30470
tert-butanol-d9	25725-11-5	PTM	20,000	30618
diisopropyl ether (DIPE)	108-20-3	PTM	2,000	30627
ethanol	64-17-5	PTM	2,000	30288
ethanol	64-17-5	W	10,000	30466
ethyl-*tert*-butyl ether (ETBE)	637-92-3	PTM	2,000	30628
methanol	67-56-1	W	10,000	30467
methyl *tert*-butyl ether (MTBE)	1634-04-4	PTM	2,000	30402

PTM = purge-and-trap grade methanol; W = DI water

also available

Rtx®-VMS Column
Your best choice for EPA Method 8260

- Fastest cycle times for VOCs.
- Tuned selectivity for VOCs.
- Excellent separation of gases.

See **page 67** for more information.

Acrolein

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30645 (ea.)

5,000 µg/mL in water, 1 mL/ampul
cat.# 30646 (ea.)

This product has a limited shelf life. We recommend that you order only the ampul quantity that meets your immediate needs.

1,2-Dichlorotetrafluoroethane (CFC-114)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30476 (ea.)

Chloroprene

A pure, quantitative chloroprene solution, specially stabilized in purge-and-trap grade methanol to allow dilutions for working standards in unmodified P&T methanol. The entire preparation procedure is performed under carefully monitored conditions to prevent any contamination or polymerization of the highly reactive, neat chloroprene.

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30238 (ea.)

Vinyl Acetate

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30216 (ea.)

8260A Volatile Organics Kit (2,000 µg/mL)

Changes in this revision of the method include modification of the recommended internal standard and surrogate solutions.

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30067: 4-bromofluorobenzene (2,500 µg/mL)
30240: 8260A Surrogate Mix (2,500 µg/mL)
30241: 8260A Internal Standard Mix (2,500 µg/mL)
30075: 8240/8260 System Performance Check Mix
30005: VOA Matrix Spike Mix (2,500 µg/mL)

cat.# 30242 (kit) **kit**

8260 Volatile Organics Kit (2,000 µg/mL)

Contains 1 mL each of these mixtures.
30042: 502.2 Calibration Mix #1
30043: 502.2 Calibration Mix #2
30044: 502.2 Calibration Mix #3
30045: 502.2 Calibration Mix #4
30046: 502.2 Calibration Mix #5
30047: 502.2 Calibration Mix #6
30067: 4-bromofluorobenzene (2,500 µg/mL)
30073: 8260 Surrogate Mix (2,500 µg/mL)
30074: 8260 Internal Standard Mix (2,500 µg/mL)
30075: 8240/8260 System Performance Check Mix
30005: VOA Matrix Spike Mix (2,500 µg/mL)

cat.# 30076 (kit) **kit**

TCLP VOA Mix (11 components)

benzene
2-butanone (MEK)
carbon tetrachloride
chlorobenzene
chloroform
1,4-dichlorobenzene
1,2-dichloroethane
1,1-dichloroethene
tetrachloroethene
trichloroethene
vinyl chloride

2,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30024 (ea.)

Restek Offers a Full Line of Certified Reference Materials

See **pages 438–439**.

QUALITY ISO 9001 • 17025 • Guide 34

www.restek.com/iso

Volatile Organics, *cont.*

SOM01.1 (Volatiles), QA Mixes

SOM01.1 VOA Non-Ketone Deuterated Monitoring Compounds (11 components)

benzene-d6
chloroethane-d5
chloroform-d
1,2-dichlorobenzene-d4
1,2-dichloroethane-d4
1,1-dichloroethene-d2
1,2-dichloropropane-d6
1,3-dichloropropene-d4*
1,1,2,2-tetrachloroethane-d2
toluene-d8
vinyl chloride-d3

500 µg/mL each in deuterated methanol (MeOD), 1 mL/ampul
cat.# 30624 (ea.)

*Mix of *cis* and *trans* isomers. Exact proportions will be reported on the data sheet.

SOM01.1 VOA Ketone Deuterated Monitoring Compounds (2 components)

2-butanone-d5
2-hexanone-d5

500 µg/mL each in deuterium oxide (D_2O), 1 mL/ampul
cat.# 30625 (ea.)

SOM01.1 VOA DMC Kit

500 µg/mL. 1 mL each of these mixtures.
30624: Non-Ketones
30625: Ketones

500 µg/mL. 1 mL each of these mixtures.
cat.# 30630 (kit) **kit**

04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes

CLP 04.1 VOA Internal Standard/SMC Spike Mix (6 components)

bromochloromethane
4-bromofluorobenzene
chlorobenzene-d5
1,2-dichloroethane-d4
1,4-difluorobenzene
toluene-d8

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30457 (ea.)

VOA Internal Standard Mix (3 components)

bromochloromethane
1,4-difluorobenzene
chlorobenzene-d5

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30011 (ea.)

VOA Surrogate Spike Mix (3 components)

4-bromofluorobenzene
1,2-dichloroethane-d4
toluene-d8

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30004 (ea.)

VOA Matrix Spike Mix (5 components)

benzene
chlorobenzene
1,1-dichloroethene
toluene
trichloroethene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30005 (ea.)

04.2, 04.1, and 10/92 SOW (Volatiles), QA Mixes, *cont.*

VOA Screening Mix #1 (5 components)

benzene
ethylbenzene
toluene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30001 (ea.)

VOA Screening Mix #2 (2 components)

n-dodecane
n-nonane

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30002 (ea.)

VOA Tuning Compound

4-bromofluorobenzene

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30003 (ea.)

PFTBA (MS Tuning Compound)

perfluorotributylamine (PFTBA)

Neat, 1 mL/ampul
cat.# 30482 (ea.)

Neat, 1 g
cat.# 33027 (ea.)

No data pack available.

L/C VOA Lab Control Sample

We prepare the L/C VOA lab control sample in two parts. Sample #1 contains all compounds except vinyl chloride because this compound is extremely volatile and must be replaced frequently. Sample #2 contains vinyl chloride.

L/C VOA Lab Control Sample #1 (11 components)

benzene
bromoform
carbon tetrachloride
1,2-dibromoethane
1,4-dichlorobenzene
1,2-dichloroethane
1,2-dichloropropane
cis-1,3-dichloropropene
tetrachloroethene
1,1,2-trichloroethane
trichloroethene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30092 (ea.)

L/C VOA Lab Control Sample #2

vinyl chloride

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30093 (ea.)

L/C VOA Internal Standard Mix (3 components)

chlorobenzene-d5
1,4-dichlorobenzene-d4
1,4-difluorobenzene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30091 (ea.)

Volatile Organics, *cont.*

04.2 and 04.1 (Volatiles), Calibration Mixes

CLP 04.1 VOA CAL2000 MegaMix® Standard

MEGAMIX®

(40 components)

benzene
bromodichloromethane
bromoform
carbon disulfide
carbon tetrachloride
chlorobenzene
chloroform
cyclohexane
dibromochloromethane
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
isopropylbenzene
methyl acetate
methyl *tert*-butyl ether (MTBE)
methylcyclohexane
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113)
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30456 (ea.)

502.2 Calibration Mix #1 (gases) (6 components)

bromomethane
chloroethane
chloromethane
dichlorodifluoromethane (CFC-12)
trichlorofluoromethane (CFC-11)
vinyl chloride

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30439 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30042 (ea.)

VOA Calibration Mix #1 (ketones) (4 components)

acetone
2-butanone (MEK)
2-hexanone
4-methyl-2-pentanone (MIBK)

5,000 µg/mL each in P&T methanol:water (90:10), 1 mL/ampul
cat.# 30006 (ea.)

CLP 04.1 VOA Kit #3

Contains 1 mL each of these mixtures.
30006: VOA Calibration Mix #1 (ketones)
30042: 502.2 Calibration Mix #1 (gases)
30456: CLP 04.1 VOA CAL2000 MegaMix Standard

cat.# 30460 (kit) kit

3/90 SOW (Volatiles), Calibration Mixes

CLP VOA CAL2000 MegaMix® Standard

MEGAMIX®

(28 components)

benzene
bromodichloromethane
bromoform
carbon disulfide
carbon tetrachloride
chlorobenzene
chloroform
dibromochloromethane
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
methylene chloride
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30632 (ea.)

Vinyl Acetate

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30216 (ea.)

CLP VOA CAL2000 MegaMix® Kit

MEGAMIX®

Contains 1 mL each of these mixtures.
30632: CLP VOA CAL2000 MegaMix Standard
30216: vinyl acetate

cat.# 30438 (kit) kit

VOA Calibration Mix #2 (7 components)

benzene
carbon disulfide
ethylbenzene
toluene
vinyl acetate
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30007 (ea.)

VOA Calibration Mix #3 (10 components)

carbon tetrachloride
chlorobenzene
chloroform
1,1-dichloroethane
1,1-dichloroethene
1,2-dichloropropane
methylene chloride
1,1,2-trichloroethane
trichloroethene
m-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30008 (ea.)

NEW!
Compound Index for Reference Standards

See **pages 730–736.**

Volatile Organics, *cont.*

3/90 SOW (Volatiles), Calibration Mixes, *cont.*

VOA Calibration Mix #4 (12 components)

bromodichloromethane
bromoform
dibromochloromethane
1,2-dichloroethane
cis-1,2-dichloroethene
trans-1,2-dichloroethene
cis-1,3-dichloropropene
trans-1,3-dichloropropene
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
1,1,1-trichloroethane

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30009 (ea.)

VOA Calibration Mix #5 (gases) (4 components)

bromomethane
chloroethane
chloromethane
vinyl chloride

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30010 (ea.)

CLP VOA Calibration Kit #2

Contains 1 mL each of these mixtures.
30006: VOA Calibration Mix #1 (ketones)
30010: VOA Calibration Mix #5 (gases)
30632: CLP VOA CAL2000 MegaMix Standard
30216: vinyl acetate

cat.# 30442 (kit) kit

OLC 03.2 (Volatiles), Calibration Mixes

OLC 03.2 VOA MegaMix® Standard

MEGAMIX®

(42 components)

benzene
bromochloromethane
bromodichloromethane
bromoform
carbon disulfide
carbon tetrachloride
chlorobenzene
chloroform
cyclohexane
dibromochloromethane (chlorodibromomethane)
1,2-dibromo-3-chloropropane (DBCP)
1,2-dibromoethane (EDB)
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
1,1-dichloroethane
1,2-dichloroethane
1,1-dichloroethene
cis-1,2-dichloroethene
trans-1,2-dichloroethene
1,2-dichloropropane
cis-1,3-dichloropropene
trans-1,3-dichloropropene
ethylbenzene
isopropylbenzene (cumene)
methyl acetate
methylcyclohexane
methyl *tert*-butyl ether (MTBE)
methylene chloride (dichloromethane)
styrene
1,1,2,2-tetrachloroethane
tetrachloroethene
toluene
1,2,3-trichlorobenzene
1,2,4-trichlorobenzene
1,1,1-trichloroethane
1,1,2-trichloroethane
trichloroethene
1,1,2-trichlorotrifluoroethane (CFC-113)
m-xylene*
o-xylene
p-xylene*

2,000 µg/mL each in P&T methanol, 1 mL/ampul*
cat.# 30492 (ea.)

**m*-xylene and *p*-xylene concentration is 1,000 µg/mL.

Additional VOA Calibration Mixes Required:

30006: VOA Calibration Mix #1 page 480
30007: VOA Calibration Mix #2 page 523
30008: VOA Calibration Mix #3 page 523
30009: VOA Calibration Mix #4 page 524
30010: VOA Calibration Mix #5 page 524
30003: VOA Tuning Compound page 441

International-Specific

Canada

C50 in Toluene

n-pentacontane (C50)

10 µg/mL in toluene, 1 mL/ampul

cat.# 31685 (ea.)

CCME F1 Retention Time Marker (3 components)

n-decane (C10)
n-hexane (C6)
toluene

2,000 µg/mL each in methanol, 1 mL/ampul

cat.# 30611 (ea.)

CCME PHC Calibration Mix (3 components)

n-decane (C10)
n-hexadecane (C16)
n-tetratriacontane (C34)

5,000 µg/mL each in toluene, 1 mL/ampul

cat.# 31684 (ea.)

Canadian Drinking Water Triazine Herbicides Mix

(7 components)

alachlor
atrazine
cyanazine (Bladex)
metolachlor
metribuzin
prometryne
simazine

500 µg/mL each in acetone, 1 mL/ampul

cat.# 31864 (ea.)

Canadian Drinking Water Phenoxyacid Herbicides Mix

(11 components)

bromoxynil
2,4-D
dicamba
2,4-dichlorophenol
diclofop methyl
dinoseb
pentachlorophenol
picloram
2,4,5-T
2,3,4,6-tetrachlorophenol
2,4,6-trichlorophenol

1,000 µg/mL each in acetone, 1 mL/ampul

cat.# 31868 (ea.)

Canadian Drinking Water Carbamates Mix

(5 components)

aldicarb
bendiocarb
carbaryl (Sevin)
carbofuran
triallate

100 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31865 (ea.)

Canadian Drinking Water OP Pesticides Mix

(9 components)

azinphos methyl (Guthion)
chlorpyrifos (Dursban)
diazinon
dimethoate
malathion
parathion (ethyl)
phorate
temephos (Abate)
terbufos

1,000 µg/mL each in acetonitrile, 1 mL/ampul

cat.# 31867 (ea.)

Canada - Atlantic Provinces

Atlantic RBCA EPH Mix (11 components)

acenaphthene
anthracene
benzo(a)pyrene
chrysene
n-decane (C10)
n-dodecane (C12)
n-dotriacontane (C32)
n-heneicosane (C21)
n-hexadecane (C16)
n-octacosane (C28)
naphthalene

1,000 µg/mL each in hexane:methylene chloride (85:15), 1 mL/ampul

cat.# 31872 (ea.)

Atlantic RBCA VPH Mix (12 components)

benzene
n-decane (C10)
ethylbenzene
n-heptane (C7)
n-hexane (C6)
1-methyl-3-ethylbenzene
n-octane (C8)
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul

cat.# 31871 (ea.)

International-Specific, *cont.*

Europe

Organophosphorus Pesticide Mix, European Formulation (16 components)

acephate	200 µg/mL	methamidophos	500
azinphos methyl (Guthion)	400	methidathion	200
chlorpyrifos	100	omethoate	1,000
demeton-S-methyl	200	pirimiphos methyl	100
dichlorvos (DDVP)	500	profenfos	200
dimethoate	200	pyrazophos	500
ethion	200	tokuthion (prothiofos)	200
malathion	200	tolclofos-methyl	100

In acetone, 1 mL/ampul

cat.# 32418 (ea.)

PCB Congener Standard #1 (6 components)

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32290 (ea.)

PCB Congener Standard #2 (7 components)

2,4,4'-trichlorobiphenyl (BZ #28)
2,2',5,5'-tetrachlorobiphenyl (BZ #52)
2,2',4,5,5'-pentachlorobiphenyl (BZ #101)
2,3',4,4',5-pentachlorobiphenyl (BZ #118)
2,2',3,4,4',5'-hexachlorobiphenyl (BZ #138)
2,2',4,4',5,5'-hexachlorobiphenyl (BZ #153)
2,2',3,4,4',5,5'-heptachlorobiphenyl (BZ #180)

10 µg/mL each in isooctane, 1 mL/ampul

cat.# 32294 (ea.)

Desethyl-atrazine

1,000 µg/mL in acetone, 1 mL/ampul

cat.# 32445 (ea.)

Japan

Japan Calibration Mix (9 components)

acrylonitrile
benzene
1,3-butadiene
chloroform
1,2-dichloroethane
dichloromethane
tetrachloroethylene
trichloroethylene
vinyl chloride

cylinder design

Cylinder Construction: aluminum
Cylinder Fitting: CGA-180 outlet

Spectra (Linde) 104 L Cylinders:

Size: 8 x 24 cm
Volume/Pressure: 104 liters of gas @ 1,800 psi
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide) 110 L Cylinders:

Size: 8.3 x 29.5 cm
Volume/Pressure: 110 liters of gas @ 1,800 psi
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi

cat.# 34418 (ea.)

NEW!

1 ppm in nitrogen, 110 liters @ 1,800 psi

cat.# 26367 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)

cat.# 34418-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

also available

Gas Regulators

See **pages 279–281.**

Drinking Water Odor Standard (2 components)

- Reference mix of the two most common odor-causing compounds.
- Convenient concentration for purge-and-trap analysis: 100 µg/mL in methanol.

Unpleasant odor in drinking water is associated with the growth and decay of microorganisms. The threshold value for these compounds is low (10 ppt) and purge-and-trap analyses usually are used to quantify them.

(+/–)-geosmin
2-methylisoborneol

100 µg/mL in P&T methanol, 1 mL/ampul

cat.# 30608 (ea.)

International-Specific, *cont.*

ISO/DIS 9377 Water Quality Testing

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

Reference mixtures for ISO/DIS 9377 (German H-53), a gas chromatography–flame ionization detection (GC-FID) method.

Diesel #2/Motor Oil (2 components)

diesel fuel #2 composite
motor oil

5,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31682 (ea.)

Diesel #2/Mineral Oil (2 components)

diesel fuel #2 composite
mineral oil

5,000 µg/mL each in hexane, 1 mL/ampul

cat.# 31676 (ea.)

Standard Mixture Stock Solution (2 components)

diesel #2 (additive-free)
mineral oil (additive-free [i.e., USP grade] bp 325–460 or C18–C32 retention time range)

5,000 µg/mL each in cyclohexane, 1 mL/ampul (prepares 8 mL of 1.25 µg/µL calibration curve high point) Total hydrocarbon concentration is 10,000 µg/mL.

cat.# 31630 (ea.)

Quality Control Standard Mixture, Revised (2 components)

- Updated reference materials for GC analysis of TPH in water.
- Determination of hydrocarbon oil index—applicable to drinking, surface, waste, and treated water.

diesel #2 (additive-free)
motor oil (additive-free bp 325–460 or C18–C32 retention time range)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one 900 mL quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.

cat.# 31641 (ea.)

Quality Control Standard Mixture (2 components)

- For GC analysis of total petroleum hydrocarbons (TPH) in water.
- Environmentally safer than previous methods.
- Calibration standard available as Diesel #2/motor oil and Diesel #2/mineral oil.

diesel #2 (additive-free)
mineral oil (additive-free [i.e., USP grade] bp 391–522 or C24–C40 retention time range)

500 µg/mL each in acetone, 1 mL/ampul (1 mL is enough mix to spike one quality control sample). Total hydrocarbon concentration is 1,000 µg/mL.

cat.# 31631 (ea.)

System Performance Test Standard Mixture of *n*-Alkanes (16 components)

n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)
n-octatriacontane (C38)
n-tetracontane (C40)

50 µg/mL each in hexane, 1 mL/ampul

cat.# 31678 (ea.)

Extraction Solvent Stock Solution #1 (2 components)

n-decane (C10) 20 µL/L
n-tetracontane (C40) 20 mg/L

In hexane, 5 mL/ampul

cat.# 31679 (ea.)

Extraction Solvent Stock Solution #2 (2 components)

n-decane (C10) 20 µL/L
n-tetracontane (C40) 20 mg/L

In hexane, 20 mL/ampul

cat.# 31680 (ea.)

Stearyl Stearate Test Solution

stearyl stearate

2,000 µg/mL in hexane, 10 mL/ampul

cat.# 31681 (ea.)

2,000 µg/mL in cyclohexane, 10 mL/ampul (enough to check one Florisil cartridge)

cat.# 31636 (ea.)

Florisil® Cartridge Quality Control Standard Mixture, Rev. 2 (2 components)

diesel fuel #2 composite
mineral oil

1,000 µg/mL each in hexane, 10 mL/ampul

cat.# 31677 (ea.)

n-Tetracontane (C40)

Neat, 100 mg

cat.# 31859 (ea.)

n-Decane (C10)

Neat, 1 mL/ampul

cat.# 31858 (ea.)

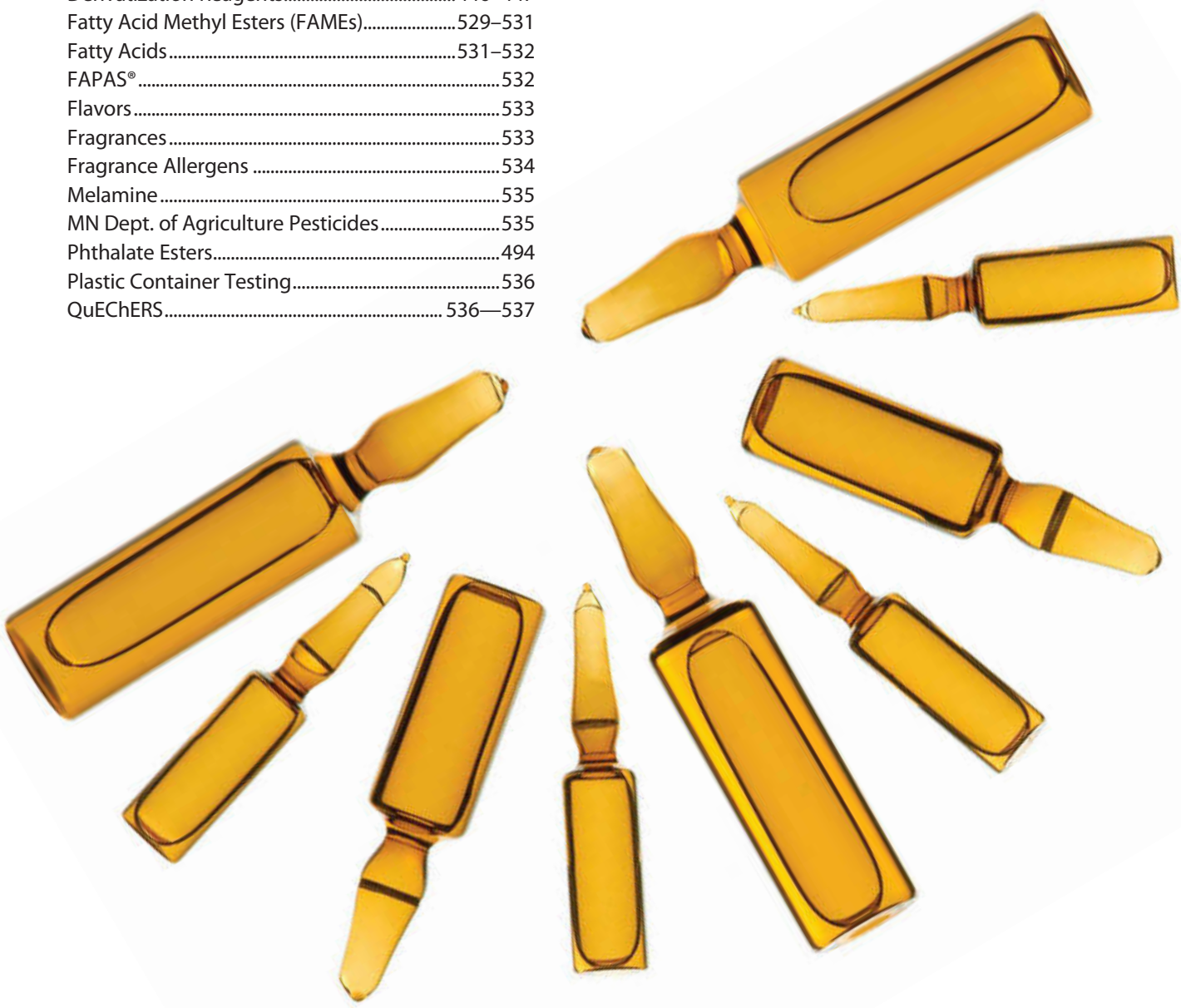
Stearyl Stearate

Neat, 100 mg

cat.# 31860 (ea.)

Reference Standards

Foods, Flavors & Fragrances



Derivatization Reagents

See pages 446–447.

Fatty Acid Methyl Esters (FAMEs)

Marine Oil FAME Mix (20 components)

Chain	Description	% by Weight
C14:0	methyl myristate	6.0
C14:1	methyl myristoleate	1.0
C16:0	methyl palmitate	16.0
C16:1	methyl palmitoleate	5.0
C18:0	methyl stearate	8.0
C18:1	methyl oleate	13.0
C18:1	methyl vaccenate	4.0
C18:2	methyl linoleate	2.0
C18:3	methyl linolenate	2.0
C20:0	methyl arachidate	1.0
C20:1	methyl 11-eicosenoate	9.0
C20:2	methyl 11,14-eicosadienoate	1.0
C20:4	methyl arachidonate	3.0
C20:3	methyl 11,14,17-eicosatrienoate	1.0
C20:5	methyl eicosapentaenoate	10.0
C22:0	methyl behenate	1.0
C22:1	methyl erucate	3.0
C22:6	methyl docosahexaenoate	12.0
C24:0	methyl lignocerate	1.0
C24:1	methyl nervonate	1.0

cat.# 35066 (100 mg)

No data pack available.

cis/trans FAME Mix (8 components)

Description	% by Weight
methyl elaidate (C18:1 *trans*-9)	10.0
methyl linoleate (C18:2 *cis*-9,12)	20.0
methyl oleate (C18:1 *cis*-9)	10.0
methyl petroselinate (C18:1 *cis*-6)	8.0
methyl petroselaidate (C18:1 *trans*-6)	8.0
methyl stearate (C18:0)	20.0
methyl transvaccenate (C18:1 *trans*-11)	12.0
methyl vaccenate (C18:1 *cis*-11)	12.0

10 mg/mL total in methylene chloride, 1 mL/ampul
cat.# 35079 (ea.)

No data pack available.

NLEA FAME Mix (28 components)

Chain	% by Weight	Chain	% by Weight
C4:0	1.5	C18:1 (*trans*-9)	2.5
C6:0	1.5	C18:1 (*cis*-9)	15.0
C8:0	2.0	C18:2 (all-*trans*-9,12)	2.5
C10:0	2.5	C18:2 (all-*cis*-9,12)	10.0
C11:0	2.5	C18:3 (all-*cis*-9,12,15)	5.0
C12:0	5.0	C20:0	2.5
C13:0	2.5	C20:1 (*cis*-11)	1.5
C14:0	2.5	C20:5 (all-*cis*-5,8,11,14,17)	2.5
C14:1 (*cis*-9)	1.5	C22:0	2.5
C15:0	1.5	C22:1 (*cis*-13)	1.5
C16:0	10.0	C22:6 (all-*cis*-4,7,10,13,16,19)	2.5
C16:1 (*cis*-9)	5.0	C23:0	1.5
C17:0	2.5	C24:0	2.5
C18:0	5.0	C24:1 (*cis*-15)	2.5

30 mg/mL total in methylene chloride, 1 mL/ampul
cat.# 35078 (ea.)

No data pack available.

Fatty Acid Methyl Esters (FAMEs), *cont.*

Food Industry FAME Mix (37 components)

Chain	% by Weight	Chain	% by Weight
C4:0	4.0	C18:2 (all-*cis*-9,12)	2.0
C6:0	4.0	C18:3 (all-*cis*-6,9,12)	2.0
C8:0	4.0	C18:3 (all-*cis*-9,12,15)	2.0
C10:0	4.0	C20:0	4.0
C11:0	2.0	C20:1 (*cis*-11)	2.0
C12:0	4.0	C20:2 (all-*cis*-11,14,)	2.0
C13:0	2.0	C20:3 (all-*cis*-8,11,14)	2.0
C14:0	4.0	C20:3 (all-*cis*-11,14,17)	2.0
C14:1 (*cis*-9)	2.0	C20:4 (all-*cis*-5,8,11,14)	2.0
C15:0	2.0	C20:5 (all-*cis*-5,8,11,14,17)	2.0
C15:1 (*cis*-10)	2.0	C21:0	2.0
C16:0	6.0	C22:0	4.0
C16;1 (*cis*-9)	2.0	C22:1 (*cis*-13)	2.0
C17:0	2.0	C22:2 (all-*cis*-13,16)	2.0
C17:1 (*cis*-10)	2.0	22:6 (all-*cis*-4,7,10,13,16,19)	2.0
C18:0	4.0	C23:0	2.0
C18:1 (*trans*-9)	2.0	C24:0	4.0
C18:1 (*cis*-9)	4.0	C24:1 (*cis*-15)	2.0
C18:2 (all-*trans*-9,12)	2.0		

30 mg/mL total in methylene chloride, 1 mL/ampul
cat.# 35077 (ea.)

No data pack available.

Fatty Acid Methyl Esters (FAMEs), *cont.*

Neat Fatty Acid Methyl Esters

Use these materials to prepare specific mixtures not commercially available. These products are of the highest purity available, typically 99% by GC-FID analysis. Each compound is packaged under a nitrogen blanket to ensure product stability. A certificate of analysis is provided with each ampul.

Chain	Description	CAS #	qty.	cat.#
C6:0	methyl caproate	106-70-7	100 mg	35037
C7:0	methyl heptanoate	106-73-0	100 mg	35038
C8:0	methyl caprylate	111-11-5	100 mg	35039
C9:0	methyl nonanoate	1731-84-6	100 mg	35040
C10:0	methyl caprate	110-42-9	100 mg	35041
C11:0	methyl undecanoate	1731-86-8	100 mg	35042
C12:0	methyl laurate	111-82-0	100 mg	35043
C13:0	methyl tridecanoate	1731-88-0	100 mg	35044
C14:0	methyl myristate	124-10-7	100 mg	35045
C14:1 Δ 9 *cis*	methyl myristoleate	56219-06-8	100 mg	35046
C15:0	methyl pentadecanoate	7132-64-1	100 mg	35047
C16:0	methyl palmitate	112-39-0	100 mg	35048
C16:1 Δ 9 *cis*	methyl palmitoleate	1120-25-8	100 mg	35049
C17:0	methyl heptadecanoate	1731-92-6	100 mg	35050
C18:0	methyl stearate	112-61-8	100 mg	35051
C18:1 Δ 9 *cis*	methyl oleate	112-62-9	100 mg	35052
C18:2 Δ 9,12 *cis*	methyl linoleate	112-63-0	100 mg	35053
C18:3 Δ 9,12,15 *cis*	methyl linolenate	301-00-8	100 mg	35054
C19:0	methyl nonadecanoate	1731-94-8	100 mg	35055
C20:0	methyl arachidate	1120-28-1	100 mg	35056
C20:1 Δ 11 *cis*	methyl eicosenoate	2390-09-2	100 mg	35057
C20:2 Δ 11,14 *cis*	methyl eicosadienoate	2463-02-7	100 mg	35058
C20:3 Δ 11,14,17 *cis*	methyl eicosatrienoate	55682-88-7	100 mg	35059
C20:4 Δ 5,8,11,14 *cis*	methyl arachidonate	2566-89-4	100 mg	35060
C21:0	methyl heneicosanoate	6064-90-0	100 mg	35061
C22:0	methyl behenate	929-77-1	100 mg	35062
C22:1 Δ 13 *cis*	methyl erucate	1120-34-9	100 mg	35063
C24:0	methyl lignocerate	2442-49-1	100 mg	35064
C24:1 Δ 15 *cis*	methyl nervonate	2733-88-2	100 mg	35065

No data pack available.

Fatty Acid Methyl Esters (FAMEs), *cont.*

Quantitative Fatty Acid Methyl Ester (FAME) Mixtures

These mixtures can be used for quantification (AOCS Method CE 1–62) and approximate the compositions of the following types of oils:

AOCS #1: corn, poppy seed, cotton seed, soybean, walnut, safflower, sunflower, rice, bran, and sesame oil
AOCS #2: linseed, perilla, hempseed, and rubberseed oil
AOCS #3: peanut, rapeseed, and mustard seed oil
AOCS #4: olive, teaseed, and neatsfoot oil
AOCS #5: coconut, palm kernel, babassu, and ouri-curi oil
AOCS #6: lard, beef or mutton tallow, and palm oil
FAME #1: oils of mid-range chain lengths (C16–C18)
FAME #2: oils of short- to mid-range chain lengths (C6–C14)
FAME #3: oils of short- to mid-range chain lengths (C8–C16)
FAME #4: oils of mid-range to long chain lengths (C16–C24)
FAME #5: oils of mid-range to long chain lengths (C16–C24)
FAME #6: oils of long chain lengths (C20–C21)
FAME #7: oils of short chain lengths (C6–C10)
FAME #8: oils of short- to mid-range chain lengths (C11–C15)
FAME #9: oils of mid-range to long chain lengths (C16–C20)
FAME #12: oils of mid-range to long chain lengths (C13–C21)
FAME #13: mustard seed oil
FAME #14: cocoa butter
FAME #15: peanut oil

Mix	cat.#	methyl caproate (6:0)	methyl heptanoate (7:0)	methyl caprylate (8:0)	methyl nonanoate (9:0)	methyl caprate (10:0)	methyl undecanoate (11:0)	methyl laurate (12:0)	methyl tridecanoate (13:0)	methyl myristate (14:0)	methyl pentadecanoate (15:0)	methyl palmitate (16:0)	methyl palmitoleate (16:1)	methyl heptadecanoate (17:0)	methyl stearate (18:0)	methyl oleate (18:1)	methyl linoleate (18:2)	methyl linolenate (18:3)	methyl nonadecanoate (19:0)	methyl arachidate (20:0)	methyl eicosenoate (20:1)	methyl eicosadienoate (20:2)	methyl homo γ-linolenate (20:3)	methyl arachidonate (20:4)	methyl heneicosanoate (21:0)	methyl behenate (22:0)	methyl erucate (22:1)	methyl docosadienoate (22:2)	methyl lignocerate (24:0)	methyl nervonate (24:1)
		Composition of each mixture listed as a weight/weight % basis (minimum 50 mg/ampul)																												
AOCS #1	35022											6.0			3.0	35.0	50.0	3.0		3.0										
AOCS #2	35023											7.0			5.0	18.0	36.0	34.0												
AOCS #3	35024									1.0		4.0			3.0	45.0	15.0	3.0		3.0						3.0	20.0		3.0	
AOCS #4	35025											11.0			3.0	80.0	6.0													
AOCS #5	35026			7.0		5.0		48.0		15.0		7.0			3.0	12.0	3.0													
AOCS #6	35027									2.0		30.0	3.0		14.0	41.0	7.0	3.0												
FAME #1	35010											20.0			20.0	20.0	20.0	20.0												
FAME #2	35011	20.0		20.0		20.0		20.0		20.0																				
FAME #3	35012			20.0		20.0		20.0		20.0																				
FAME #4	35013											20.0			20.0						20.0						20.0		20.0	
FAME #5	35014												20.0			20.0						20.0						20.0		20.0
FAME #6	35015																			20.0	20.0	20.0	20.0	20.0						
FAME #7	35016	20.0	20.0	20.0	20.0	20.0																								
FAME #8	35017						20.0	20.0	20.0	20.0	20.0																			
FAME #9	35018											20.0		20.0	20.0					20.0	20.0									
FAME #12	35021								20.0		20.0			20.0						20.0						20.0				
FAME #13	35034											3.0	1.0		2.0	20.0	15.0	10.0		1.0	10.0	2.0				1.0	30.0	2.0	1.0	2.0
FAME #14	35035									0.1		26.3	0.4	0.3	33.7	34.3	3.1	0.2		1.3	0.1					0.2				
FAME #15	35036											10.0			3.0	50.0	30.0			1.5	1.5					3.0			1.0	

Composition of each compound listed as a weight/weight % basis.

Fatty Acids

EP 2.4.22 Composition of Fatty Acids by GC Mix 1

(6 components)

Description	% by Weight
methyl arachidate (C20:0)	40
methyl dodecanoate (C12:0)	5
methyl myristate (C14:0)	5
methyl oleate (C18:1 [*cis*9])	20
methyl palmitate (C16:0)	10
methyl stearate (C18:0)	20

100 mg total

cat.# 35100 (ea.)

No data pack available.

EP 2.4.22 Composition of Fatty Acids by GC Mix 2

(5 components)

Description	% by Weight
methyl caproate (C6:0)	10
methyl caprylate (C8:0)	10
methyl decanoate (C10:0)	20
methyl dodecanoate (C12:0)	20
methyl myristate (C14:0)	40

100 mg total

cat.# 35101 (ea.)

No data pack available.

Fatty Acids, *cont.*

Standard Methods for the Examination of Water and Wastewater Method 5560: Organic and Volatile Acids

The measurement of organic acids, either by adsorption and elution from a chromatographic column or by distillation, can be used as a control test for anaerobic digestion. The chromatographic separation method is presented for organic acids (5560B), while a method using distillation (5560C) is presented for volatile acids. A new method using gas chromatography is included for the determination of acetic, propionic, butyric, isobutyric, valeric, and isovaleric acids (5560D).

Free Fatty Acids Test Standard (6 components)

acetic acid
butyric acid (C4:0)
isobutyric acid
isovaleric acid
propionic acid
valeric acid

1,000 µg/mL each in water, 1 mL/ampul

cat.# 35272 (ea.)

Food Analysis Performance Assessment Scheme (FAPAS®)

FAPAS® Food Testing Program*

Laboratories testing food quality and safety are encouraged to routinely perform proficiency tests. Proficiency testing is an external check of quality. It provides an independent and unbiased assessment of the performance of all aspects of the laboratory, both human and hardware. Each participating laboratory is encouraged to use its normal analytical method, thereby simulating the testing of a routine laboratory sample as closely as possible. While the outcome of the analysis may depend on the choice of method, it also could be affected by the performance of the laboratory equipment or the competence of the analyst. Using proficiency testing, those laboratories performing well can ensure high standards are maintained and those performing unsatisfactorily can implement corrective action rapidly. In an environment in which analytical laboratories compete intensively for work, proficiency testing provides the means by which external customers can compare competence in carrying out specific tests. Together with laboratory accreditation and the use of validated methods, proficiency tests are an important requirement of the EU Additional Measures Directive 93/99/EEC applying to laboratories entrusted with the official control of food.

FAPAS® Series 5 OC Pesticide Mix 1 (19 components)

Equal concentration of all compounds. Suitable for GC-MS analysis.

aldrin
α-BHC
β-BHC
γ-BHC (lindane)
cis-chlordane
trans-chlordane
4,4'-DDD
4,4'-DDE
2,4'-DDT
4,4'-DDT
dieldrin
α-endosulfan (I)
β-endosulfan (II)
endosulfan sulfate
endrin
heptachlor
heptachlor epoxide (isomer B)
hexachlorobenzene
oxychlordane

100 µg/mL each in acetone, 1 mL/ampul

cat.# 32412 (ea.)

Food Analysis Performance Assessment Scheme (FAPAS®), *cont.*

FAPAS® Food Testing Program*, *cont.*

FAPAS® Series 5 OC Pesticide Mix 2 (19 components)

Varied concentrations. Suitable for GC-ECD analysis.

aldrin	10 µg/mL	dieldrin	20
α-BHC	10	α-endosulfan (I)	10
β-BHC	10	β-endosulfan (II)	20
γ-BHC (lindane)	10	endosulfan sulfate	20
cis-chlordane	10	endrin	20
trans-chlordane	10	heptachlor	10
4,4'-DDD	20	heptachlor epoxide (isomer B)	10
4,4'-DDE	20	hexachlorobenzene	10
2,4'-DDT	20	oxychlordane	10
4,4'-DDT	20		

In acetone, 1 mL/ampul

cat.# 32414 (ea.)

FAPAS® Series 9 OP Pesticide Mix 1 (10 components)

Equal concentration of all compounds. Suitable for GC-FPD, GC-NPD, and GC-MS analysis.

chlorpyriphos
chlorpyriphos-methyl
diazinon
dichlorvos
etrimphos
fenitrothion
malathion
methacriphos
phosphamidon
pirimiphos-methyl

100 µg/mL each in acetone, 1 mL/ampul

cat.# 32413 (ea.)

*Use of Restek calibration mixtures by laboratories participating in the FAPAS® program is voluntary; no endorsement of any Restek product has been made by the Central Science Laboratory. To obtain further information regarding the FAPAS® program, or to participate, contact fapas@csl.gov.uk

Flavors

Fruit Juice Organic Acid Standard (5 components)

citric acid	2,000 µg/ml	quinic acid	2,000
fumaric acid	10*	tartaric acid	2,000
malic acid	2,000		

In water, 1 mL/ampul
cat.# 35080 (ea.)

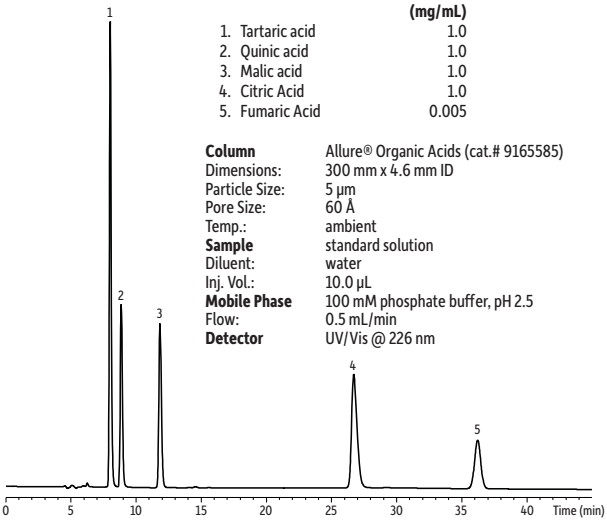
In water, 5 mL/ampul
cat.# 35081 (ea.)

*Fumaric acid is a trace impurity in malic acid, as well as an added component of the mix. The amount of fumaric acid in malic acid will not affect the stated concentration of malic acid, but can represent a significant and variable deviation from the low concentration of fumaric acid stated to be in the mix. All other components of the mix are at the specified concentration.

Organic Acids Standard on Allure® Organic Acids

Peaks	Conc. (mg/mL)
1. Tartaric acid	1.0
2. Quinic acid	1.0
3. Malic acid	1.0
4. Citric Acid	1.0
5. Fumaric Acid	0.005

Column	Allure® Organic Acids (cat.# 9165585)
Dimensions:	300 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	60 Å
Temp.:	ambient
Sample	standard solution
Diluent:	water
Inj. Vol.:	10.0 µL
Mobile Phase	100 mM phosphate buffer, pH 2.5
Flow:	0.5 mL/min
Detector	UV/Vis @ 226 nm



LC_0238

Fragrances

Fragrance Materials Test Mix (12 components)

- Performance evaluation for essential oils and fragrance chemicals.
- System suitability mixture for GC systems and analytical columns.
- Convenient 0.5 mL quantity for easy dilution to recommended working solution.

The Fragrance Materials Association (FMA) has proposed a method for analyzing essential oils on polar and nonpolar capillary GC columns. A performance evaluation mixture should be used to aid in detecting inlet problems, stationary phase degradation, loss of resolution, changes in sensitivity, and the presence of reactive sites in the sample pathway. Our test mix is consistent with the mixture proposed by the FMA. The required 5% test solution is made by diluting the 0.5 mL of neat mixture to 10 mL with acetone. The working solution will be stable for up to one week if transferred to a dark container and stored refrigerated.

benzoic acid	1.0%	geraniol	0.6%
benzyl salicylate	36.2%	hydroxycitronellal (3,7-dimethyl-7-hydroxyoctanal)	5.0%
1,8-cineole (eucalyptol)	0.5%	d-limonene	20.0%
trans cinnamaldehyde	0.5%	thymol	0.3%
cinnamyl acetate	0.3%	vanillin	0.1%
cinnamyl alcohol	0.3%		
ethyl butyrate	36.2%		

Neat, 0.5 mL in an amber ampul
cat.# 31807 (ea.)

No data pack available.

Fragrance Allergens

Fragrance Allergen Standards Kit

- Highly stable formulation has a minimum shelf life of 18 months.
- Fully resolves 31 fragrance allergens with one analysis on an Rxi®-17 column.
- Ideal for GC-MS analysis following IFRA methodology.
- Helps you meet EU requirements defined in the European Cosmetics Directive.
- All components included at 400 ppm to allow dilution for calibration curves and use with different solvents.
- Exceeds purity requirements outlined in IFRA method.

To help protect consumers with allergies, the 7th Amendment to the European Cosmetics Directive mandates that finished cosmetic products and personal care products must indicate if they contain excess amounts of any allergen on a list of 26 compounds. Of those 26, 24 are volatile chemicals that can be determined through GC-MS analysis, and version 3 of the method outlined by the International Fragrance Association (IFRA) does just that.

This specially formulated reference standard kit exceeds IFRA purity requirements and contains all 24 EU-defined fragrance allergens detectable by GC-MS, along with seven additional potential allergens. When analyzed on a Restek Rxi®-17 column following the IFRA method, all required compounds and isomers resolve clearly with no coelutions. This time-saving mix is also incredibly robust with a shelf life of over one and a half years, so you can stock an already-made standard instead of spending the time to create a new batch for every analysis.

Whether you manufacture fragrances in Europe, sell to European consumers, or simply wish to test for allergens in your products, choose the reference standard mix that helps you follow IFRA methodology in one convenient, long-lasting formulation.

MTBE Solvent Blank		
methyl *tert*-butyl ether (MTBE)	CAS # 1634-04-4	Neat
1-Fluoronaphthalene (Internal Standard)		
1-fluoronaphthalene	CAS # 321-38-0	20 µg/mL
Fragrance Allergen Standard A (Includes Internal Standard)		
α-amylcinnamaldehyde*†	CAS # 122-40-7	400 µg/mL
cinnamal*	CAS # 104-55-2	400
citral*†	CAS # 5392-40-5	400
3,7-dimethyl-7-hydroxyoctanal*	CAS # 107-75-5	400
1-fluoronaphthalene	CAS # 321-38-0	20
α-hexylcinnamaldehyde*†	CAS # 101-86-0	400
lilial*	CAS # 80-54-6	400
lyral*†	CAS # 31906-04-4	400
phenylacetaldehyde**	CAS # 122-78-1	400
Fragrance Allergen Standard B (Includes Internal Standard)		
α-amylcinnamic alcohol*†	CAS # 101-85-9	400 µg/mL
benzyl alcohol*	CAS # 100-51-6	400
cinnamyl alcohol*	CAS # 104-54-1	400
citronellol*	CAS # 106-22-9	400
eugenol*	CAS # 97-53-0	400
farnesol*†	CAS # 4602-84-0	400
1-fluoronaphthalene	CAS # 321-38-0	20
geraniol*	CAS # 106-24-1	400
isoeugenol*	CAS # 97-54-1	400
linalool*	CAS # 78-70-6	400
4-methoxybenzyl alcohol*	CAS # 105-13-5	400
methyl eugenol**	CAS # 93-15-2	400

Fragrance Allergen Standard C (Includes Internal Standard)		
4-allylanisole**	CAS # 140-67-0	400 µg/mL
benzyl benzoate*	CAS # 120-51-4	400
benzyl cinnamate*	CAS # 103-41-3	400
benzyl salicylate*	CAS # 118-58-1	400
camphor**	CAS # 76-22-2	400
1,8-cineole**	CAS # 470-82-6	400
coumarin*	CAS # 91-64-5	400
1-fluoronaphthalene	CAS # 321-38-0	20
limonene*	CAS # 138-86-3	400
iso-α-methylionone*	CAS # 127-51-5	400
methyl 2-nonynoate**	CAS # 111-80-8	400
methyl 2-octynoate*	CAS # 111-12-6	400
safrole**	CAS # 94-59-7	400

*Compound listed in 7th Amendment to the European Cosmetics Directive.
**Additional potential allergens included in this formulation.
†Compounds defined as two isomers resulting in two chromatographic peaks.

Contains 1 mL each of these mixtures (in methyl *tert*-butyl ether).

cat.# 33105 (kit)

NEW! kit

NEW! Compound Index for Reference Standards

See **pages 730–736.**

Melamine

Melamine Analysis Kit

Kit includes:
Column:
Rxi-5Sil MS w/5-meter Integra-Guard
Standards:

33247: 1 mL Melamine Stock Standard	(1,000 µg/mL)
33248: 1 mL Cyanuric Acid Stock Standard	(1,000 µg/mL)
33249: 1 mL Ammelide Stock Standard	(1,000 µg/mL)
33250: 1 mL Ammeline Stock Standard	(1,000 µg/mL)
33251: 1 mL Benzoguanamine Internal Standard	(1,000 µg/mL)
33253: 1 mL Melamine Mix Standard	(1,000 µg/mL)

Derivatization Reagent:
35607: BSTFA w/1% TMCS, 25 g vial
Accessories:
50 mL empty centrifuge tubes, 10-pk.
13 mm, 0.45 µm nylon syringe filters, 20-pk.
Easy-to-follow instructions with procedural checklists to assist with laboratory documentation.

Contains contents listed above.
cat.# 33254 (kit) kit

*Kit contains a 10-pk. of tubes and 20-pk. of filters. 50-pk. of tubes (cat.# 26239) and 100-pk. of filters (cat.# 26147) sold separately.

Melamine and Related Analogs Stock Standard

(4 components)

ammelide
ammeline
cyanuric acid
melamine

1,000 µg/mL each in diethylamine:water (20:80), 1 mL/ampul
cat.# 33253 (ea.)

Melamine Stock Standard

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33247 (ea.)

Cyanuric Acid Stock Standard

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33248 (ea.)

Ammelide Stock Standard

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33249 (ea.)

Ammeline Stock Standard

1,000 µg/mL in diethylamine:water (20:80), 1 mL/ampul
cat.# 33250 (ea.)

Benzoguanamine Internal Standard

1,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33251 (ea.)

MN Dept. of Agriculture Pesticides

Minnesota Ag List 1 Pesticides Mix A (16 components)

acetochlor
alachlor
atrazine
cyanazine
desethylatrazine
desisopropylatrazine
dimethenamid*
ethalfluralin
metolachlor
metribuzin
pendimethalin
prometon
propachlor
propazine
simazine
trifluralin

200 ppm each in acetone, 1 mL/ampul
cat.# 32406 (ea.)

*Added to Minnesota Department of Agriculture List 1 pesticide (neutrals) incident investigation requirements, effective January 1, 2000.[1] CAS # 87674-68-8 manufactured by several companies under various trade names.
[1]Analytical Lists for Pesticide Incident Investigations, Minnesota Department of Agriculture, Guidance Document 26 (3/99), St. Paul, MN. For a copy, visit their website at: **www.mda.state.mn.us**

Minnesota Ag List 1 Pesticides Mix B (6 components)

chlorpyrifos
EPTC
fonofos
phorate
terbufos
triallate

200 ppm each in acetone, 1 mL/ampul
cat.# 32407 (ea.)

Minnesota Ag List 1 Pesticide Kit

Contains 1 mL each of these mixtures.
32406: Minnesota Ag List Pesticides Mix A
32407: Minnesota Ag List Pesticides Mix B

cat.# 32408 (kit) kit

also available

Rxi®-5Sil MS Column

Ideal for pesticide and melamine analysis

For details, see **page 32**.
See **page 492** for chromatogram.

Phthalate Esters

See page 494.

Plastic Container Testing

ASTM Method D6042-96 (Plastic Container Testing)

American Society for Testing and Materials (ASTM International) Method D6042-96—Test Method for Determination of Phenolic Antioxidants and Erucamide Slip Additives in Polypropylene Homopolymer Formulations Using Liquid Chromatography—is a "consensus" or "referee" method used among plastic manufacturers and the pharmaceutical companies that purchase plastic containers. Plastic container manufacturers use this test to ensure the quality of their product to their pharmaceutical customers. Pharmaceutical companies also specify this test and provide their own lists of target compounds and concentration limits in purchase agreements.

This test calls for isopropanol extraction, LC separation, and UV detection. Restek offers a variety of reversed phase LC columns suitable for these separations. Restek also designed a reference standard to validate this method. This mixture contains the common antioxidants and slips listed in ASTM D6042-96, along with BHT.

ASTM D6042-96 Calibration Mix (7 components)

BHT	Irganox 3114
erucamide slip	Irganox 1010
vitamin E	Irganox 1076
Irgafos 168	

50 µg/mL each in isopropanol, 1 mL/ampul

cat.# 31628 (ea.)

No data pack available.

Other Additives Available From Restek on a Custom Basis

Similar methods for extractables in plastic pharmaceutical containers are cited in the United States Pharmacopeia (USP), British Pharmacopoeia (BP), European Pharmacopoeia (EP), and Japanese Pharmacopoeia (JP). Customers may also have formulation-specific or product-specific test mixtures. Please contact us for a custom mixture. Our current inventory of raw materials includes these popular antioxidants. We have many more not listed and can obtain most compounds you may need. Visit **www.restek.com/solutions** to request yours today!

- Ethanox 323
- Ethanox 330
- Ethanox 702
- Ethanox 703
- Irganox® L06
- Irganox® L57
- Irganox® L64
- Irganox® L109
- Irganox® L134
- Irganox® L135
- Irganox® 1035
- Santanox R
- Ultranox® 626
- Vanlube® 81
- Vanlube® 848
- Vanlube® 7723
- Vanlube® AZ
- Vanlube® NA
- Vanlube® PCX
- Vanlube® SL
- Vanlube® SS

QuEChERS

QuEChERS Standards

- Ready to use for QuEChERS extractions—no dilutions necessary.
- Support for GC and LC with MS, MS/MS, and selective detectors.

Pesticide analysis is fast and simple using QuEChERS methods. Use these cost-effective QuEChERS standards for even greater lab efficiency. Standards are compatible with all major methods, including mini-multiresidue, AOAC, and European procedures. Save time with convenient mixes or make your own blend using our full line of single-component solutions.

QuEChERS Internal Standard Mix for GC-ECD Analysis (4 components)

PCB 18	PCB 52
PCB 28	tris-(1,3-dichloroisopropyl)phosphate

50 µg/mL each in acetonitrile, 5 mL/ampul

cat.# 33265 (ea.)

QuEChERS Internal Standard Mix for GC-NPD and LC-MS/MS Analysis (2 components)

triphenyl phosphate	20 µg/mL
tris-(1,3-dichloroisopropyl)phosphate	50 µg/mL

In acetonitrile, 5 mL/ampul

cat.# 33266 (ea.)

QuEChERS Internal Standard Mix for GC-MS Analysis (6 components)

PCB 18	50 µg/mL	triphenyl phosphate	20
PCB 28	50	tris-(1,3-dichloroisopropyl)phosphate	50
PCB 52	50	triphenylmethane	10

In acetonitrile, 5 mL/ampul

cat.# 33267 (ea.)

QuEChERS Internal Standard Mix for LC-MS/MS Analysis

nicarbazin

10 µg/mL in acetonitrile, 5 mL/ampul

cat.# 33261 (ea.)

QuEChERS Quality Control Standards for GC-MS Analysis

Cat.# 33268:	**Cat.# 33264:**
PCB 138	anthracene
PCB 153	

50 µg/mL each in acetonitrile, 5 mL/ampul

cat.# 33268 (ea.)

100 µg/mL in acetonitrile, 5 mL/ampul

cat.# 33264 (ea.)

QuEChERS, *cont.*

QuEChERS Standards, *cont.*

QuEChERS Single-Component Reference Standards

Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
PCB 18 (5 mL)	37680-65-2	ACN	50	33255
PCB 28 (5 mL)	7012-37-5	ACN	50	33256
PCB 52 (5 mL)	35693-99-3	ACN	50	33257
PCB 138 (5 mL)	35065-28-2	ACN	50	33262
PCB 153 (5 mL)	35065-27-1	ACN	50	33263
triphenylmethane (5 mL)	519-73-3	ACN	10	33260
triphenylphosphate (5 mL)	115-86-6	ACN	20	33258
tris(1,3-dichloroisopropyl)phosphate (5 mL)	13674-87-8	ACN	50	33259

ACN = acetonitrile

QuEChERS Standards for AOAC Official Method 2007.01

- Ready to use for generating text mixes, calibration standards, and spiking experiments.
- Reliable standards produced according to specifications defined in AOAC Official Method 2007.01.
- Cost-effective QuEChERS standards can be used without dilutions for greater lab efficiency.

Following QuEChERS methods is even quicker and easier when you use Restek method-specific chemical standards for AOAC Official Method 2007.01 (Pesticide Residues in Foods by Acetonitrile Extraction and Partitioning with Magnesium Sulfate). Our suite of AOAC QuEChERS standards includes internal standards mix, triphenylphosphate (TPP) solution, and QC spike mix. Each standard can be used directly without dilutions because they are formulated to the exact concentrations prescribed by AOAC Method 2007.01.

AOAC QuEChERS IS Solution (2 components)

α-BHC-d6 (α-HCH-d6)
parathion-d10

40 µg/mL each in acetonitrile, 5 mL/ampul
cat.# 31963 (ea.)

NEW!

AOAC QuEChERS Triphenylphosphate Solution

2 µg/mL in acetonitrile:acetic acid (99:1), 5 mL/ampul
cat.# 31964 (ea.)

NEW!

AOAC QuEChERS QC Spike Mix (27 components)

atrazine
azoxystrobin
bifenthrin
carbaryl (Sevin)
chlorothalonil
chlorpyrifos (Dursban)
chlorpyrifos methyl
lambda-cyhalothrin
cyprodinil
2,4'-DDD
dichlorvos (DDVP)
endosulfan sulfate
ethion
imazalil
imidacloprid
kresoxim methyl
linuron
methamidophos
methomyl
cis-permethrin
trans-permethrin
procymidone
pymetrozine
tebuconazole (Folicur)
thiabendazole
tolylfluanid
trifluralin

40 µg/mL each in acetonitrile:acetic acid (99.9:0.1), 5 mL/ampul
cat.# 31999 (ea.)

NEW!

Reference Standards

Petroleum & Petrochemical

Biodiesel

ASTM Method D6584-10 and EN14105 (Biodiesel)

Determining Free and Total Glycerin in B100 Biodiesel Methyl Esters by GC

In the manufacture of biodiesel fuel, triglycerides are split into their monoalkyl ester components via transesterification. The fatty acid monoalkyl esters can be used as fuel in diesel engines. Amounts of free glycerin and total glycerin indicate the quality of the conversion of the oil or fat to monoalkyl esters. D6584-10 and DIN EN14105 are test methods for quantitative determination of free glycerin, total glycerin, and mono-, di-, and triglycerides in biodiesel fuel methyl esters by GC, after silylation of the sample with N-methyl-N-(trimethylsilyl) trifluoroacetamide (MSTFA).

(s)-(-)-1,2,4-Butanetriol

1,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33024 (ea.)

1,000 µg/mL in pyridine, 5 mL/ampul
cat.# 33032 (ea.)

Diolein (1,3-di[*cis*-octadecenoyl]glycerol)

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33022 (ea.)

Glycerin

500 µg/mL in pyridine, 1 mL/ampul
cat.# 33020 (ea.)

Monolein (1-mono[*cis*-9-octadecenoyl]-rac-glycerol)

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33021 (ea.)

Monopalmitin

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33026 (ea.)

Tricaprin (1,2,3-tricaprinoylglycerol)

8,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33025 (ea.)

8,000 µg/mL in pyridine, 5 mL/ampul
cat.# 33033 (ea.)

Triolein (1,2,3-tri[*cis*-octadecenoyl]glycerol)

5,000 µg/mL in pyridine, 1 mL/ampul
cat.# 33023 (ea.)

Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

Finished Motor Oil & Aviation Gasoline

ASTM D3606-10 (Determination of Benzene & Toluene in Finished Motor & Aviation Gasoline by GC)

ASTM D3606 Calibration Kit Without Internal Standard

Contains 25 mL each of these mixtures.
30647: ASTM D3606 Calibration Standard #1 Without Internal Standard
30648: ASTM D3606 Calibration Standard #2 Without Internal Standard
30649: ASTM D3606 Calibration Standard #3 Without Internal Standard
30650: ASTM D3606 Calibration Standard #4 Without Internal Standard
30651: ASTM D3606 Calibration Standard #5 Without Internal Standard
30652: ASTM D3606 Calibration Standard #6 Without Internal Standard
30653: ASTM D3606 Calibration Standard #7 Without Internal Standard

cat.# 30672 (kit) **kit**

Find complete compound lists for our **D3606 reference standards** at

www.restek.com/**D3606standards**

ASTM D3606 Calibration Kit With MEK Internal Standard

Contains 1 mL each of these mixtures.
30654: ASTM D3606 Calibration Standard #1 With MEK Internal Standard
30655: ASTM D3606 Calibration Standard #2 With MEK Internal Standard
30656: ASTM D3606 Calibration Standard #3 With MEK Internal Standard
30657: ASTM D3606 Calibration Standard #4 With MEK Internal Standard
30658: ASTM D3606 Calibration Standard #5 With MEK Internal Standard
30659: ASTM D3606 Calibration Standard #6 With MEK Internal Standard
30660: ASTM D3606 Calibration Standard #7 With MEK Internal Standard

cat.# 30673 (kit) **kit**

ASTM D3606 Calibration Kit With *sec*-Butanol Internal Standard

Contains 1 mL each of these mixtures.
30661: ASTM D3606 Calibration Standard #1 With *sec*-Butanol Internal Standard
30662: ASTM D3606 Calibration Standard #2 With *sec*-Butanol Internal Standard
30663: ASTM D3606 Calibration Standard #3 With *sec*-Butanol Internal Standard
30664: ASTM D3606 Calibration Standard #4 With *sec*-Butanol Internal Standard
30665: ASTM D3606 Calibration Standard #5 With *sec*-Butanol Internal Standard
30666: ASTM D3606 Calibration Standard #6 With *sec*-Butanol Internal Standard
30667: ASTM D3606 Calibration Standard #7 With *sec*-Butanol Internal Standard

cat.# 30674 (kit) **kit**

ASTM D3606 Backflush Standard

2,2,4-trimethylpentane (isooctane)

5% vol/vol in nonane, 1 mL/ampul

cat.# 30671 (ea.)

PCBs in Transformer Oil

ASTM Method D4059-00 (PCB Standards in Oil)

ASTM Method D4059-00 is used for determining PCB concentrations in various types of transformer oil using GC-ECD detection. The analyst must dilute transformer oil samples in a solvent prior to injection. The oil in the sample has been shown to quench the ECD. Calibration mixtures of PCBs in transformer oil must be prepared and diluted identically to eliminate the detector quenching bias resulting when samples are analyzed.

We prepare these solutions in a mineral oil–based transformer oil (Exxon® Univolt® N-61), which has been tested to ensure it is PCB-free.

PCB-Free Transformer Oil

Neat, 5 mL
cat.# 32424 (ea.)

Neat, 50 mL
cat.# 32425 (ea.)

No data pack available.

Aroclor Standards

Volume is 1 mL/ampul.

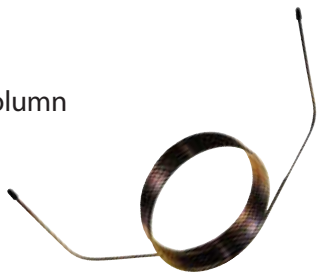
Compound	CAS #	Solvent	Conc.	cat.#
Aroclor 1016	12674-11-2	TO	50 mg/kg	32075
Aroclor 1016	12674-11-2	TO	500 mg/kg	32076
Aroclor 1221	11104-28-2	TO	50 mg/kg	32077
Aroclor 1221	11104-28-2	TO	500 mg/kg	32078
Aroclor 1232	11141-16-5	TO	50 mg/kg	32079
Aroclor 1232	11141-16-5	TO	500 mg/kg	32080
Aroclor 1242	53469-21-9	TO	50 mg/kg	32081
Aroclor 1242	53469-21-9	TO	500 mg/kg	32082
Aroclor 1248	12672-29-6	TO	50 mg/kg	32083
Aroclor 1248	12672-29-6	TO	500 mg/kg	32084
Aroclor 1254	11097-69-1	TO	50 mg/kg	32085
Aroclor 1254	11097-69-1	TO	500 mg/kg	32086
Aroclor 1260	11096-82-5	TO	50 mg/kg	32087
Aroclor 1260	11096-82-5	TO	500 mg/kg	32088

TO = transformer oil (PCB-free)

also available

D3606 Application Column (2 column set)

See **page 120** for details.



Simulated Distillation

ASTM Simulated Distillation Petroleum Fractions

ASTM D2887-08 Calibration Mix (20 components)

American Society for Testing and Materials (ASTM International) Method D2887-08 is used to determine the boiling range distribution of petroleum products and fractions having a final boiling point of 538 °C (1,000 °F) or lower; a boiling range greater than 55 °C (131 °F); and a vapor pressure sufficiently low to permit sampling at ambient temperature.

n-pentane (C5)
n-hexane (C6)
n-heptane (C7)
n-octane (C8)
n-nonane (C9)
n-decane (C10)
n-undecane (C11)
n-dodecane (C12)
n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)
n-heptadecane (C17)
n-octadecane (C18)
n-eicosane (C20)
n-tetracosane (C24)
n-octacosane (C28)
n-dotriacontane (C32)
n-hexatriacontane (C36)
n-tetracontane (C40)
n-tetratetracontane (C44)

1% w/w in carbon disulfide, 1 g solution/ampul*
cat.# 31674 (ea.)

5% w/w, Neat, 1 g /ampul
cat.# 31675 (ea.)

No data pack available.
*Orders in the U.S. ship FedEx only. Call for options when shipping outside the U.S.

ASTM Methods D2887 and D3710-95

These calibration mixtures are made with pure, highly characterized neat material and are prepared using NIST-traceable balances and weights. Each ampul is supplied with a data sheet indicating the exact concentration and a sample chromatogram.

D2887 Calibration Mix (17 components)

Compound	Conc. (% w/w)	Compound	Conc. (% w/w)
n-hexane (C6)	6	*n*-octadecane (C18)	5
n-heptane (C7)	6	*n*-eicosane (C20)	2
n-octane (C8)	8	*n*-tetracosane (C24)	2
n-nonane (C9)	8	*n*-octacosane (C28)	1
n-decane (C10)	12	*n*-dotriacontane (C32)	1
n-undecane (C11)	12	*n*-hexatriacontane (C36)	1
n-dodecane (C12)	12	*n*-tetracontane (C40)	1
n-tetradecane (C14)	12	*n*-tetratetracontane (C44)	1
n-hexadecane (C16)	10		

Packaged 1 mL/ampul
cat.# 31222 (ea.)

No data pack available.

D3710-95 Calibration Mix (16 components)

Compound	Conc. (% vol/vol)	Compound	Conc. (% vol/vol)
n-pentane (C5)	8	*n*-pentadecane (C15)	2
n-hexane (C6)	6	2-methylbutane	10
n-heptane (C7)	10	2-methylpentane	6
n-octane (C8)	5	2,4-dimethylpentane	6
n-decane (C10)	4	toluene	12
n-dodecane (C12)	4	*p*-xylene	14
n-tridecane (C13)	2	*n*-propylbenzene	5
n-tetradecane (C14)	2	*n*-butylbenzene	4

Packaged 1 mL/ampul
cat.# 31223 (ea.)

No data pack available.

ASTM Method 6352-04 (Polywax® Standards)

Polywax Standards

These high molecular weight hydrocarbon waxes are useful for simulated distillation and other high-temperature GC work.

Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
Polywax 500	9002-88-4	Neat	1 g	36224
Polywax 655	9002-88-4	Neat	1 g	36225
Polywax 850	9002-88-4	Neat	1 g	36226
Polywax 1000	9002-88-4	Neat	1 g	36227

No data pack available.

Petroleum Standards

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and have been verified by one or more analytical methods.

Sulfur Simulated Distillation Standard (SSDS)

30 ppm total sulfur by weight from ethanethiol
60 ppm total sulfur by weight from 1-propanethiol
30 ppm total sulfur by weight from 1-butanethiol
60 ppm total sulfur by weight from 1-pentanethiol
30 ppm total sulfur by weight from 1-hexanethiol
60 ppm total sulfur by weight from 1-heptanethiol
30 ppm total sulfur by weight from 3,5-dimethylbenzenethiol
60 ppm total sulfur by weight from 1-octanethiol
30 ppm total sulfur by weight from 1-nonanethiol
60 ppm total sulfur by weight from 1-decanethiol
30 ppm total sulfur by weight from 1-pentadecanethiolol
60 ppm total sulfur by weight from 1-hexadecanethiol
30 ppm total sulfur by weight from 1-octadecanethiol
Balance: toluene:isooctane (1:15)

1 mL pre-scored amber ampul.
cat.# 33049 (ea.)

Speciated Sulfur System Suitability Checkout Standard (SSSSCS)

0.50 ppm total sulfur by weight from dimethylsulfide
35.0 ppm total sulfur by weight from tertiary butyl mercaptan
50.0 ppm total sulfur by weight from thiopene
15.0 ppm total sulfur by weight from dimethyl disulfide
25.0 ppm total sulfur by weight from benzothiopene
Balance: isooctane

1 mL pre-scored amber ampul.
cat.# 33050 (ea.)

Spark Ignition Engine Fuels

ASTM Method D6730-01 (Determination of Individual Components in Spark Ignition Engine Fuels)

ASTM Method D6730-01 is specifically designed for the determination of the individual hydrocarbons present in spark ignition fuels, as well as fuel blends containing oxygenates such as methyl *tert*-butyl ether, ethyl *tert*-butyl ether, *tert*-butanol, ethanol, etc.

Oxy Set-Up Blend (30 components)

Gravimetrically prepared and NIST-traceable.

benzene	1.00%	1-methylcyclopentene	0.50%
tert-butanol	0.50%	1-methyl-2-ethylbenzene	0.50%
cyclohexane	28.9%	1-methylnaphthalene	0.25%
n-decane	1.00%	5-methylnonane	0.20%
2,3-dimethylbutane	0.50%	naphthalene	0.50%
trans-1,2-dimethylcyclopentane	0.50%	*n*-nonane	2.00%
2,3-dimethylheptane	0.20%	*n*-octane	2.00%
dodecane	0.25%	*n*-pentane	2.00%
ethanol	8.00%	1,2,3,5-tetramethylbenzene	0.25%
ethylbenzene	25.0%	toluene	7.00%
3-ethylpentane	0.20%	tridecane	0.25%
n-heptane	2.00%	2,2,3-trimethylpentane	0.52%
n-hexane	2.00%	2,3,3-trimethylpentane	0.50%
2-methylbutene-2	2.50%	undecane	0.50%
methyl *tert*-butyl ether	10.0%	*p*-xylene	1.00%

2 mL prescored ampul

cat.# 33034 (ea.)

DHA PONA VI Mix

PONA-VI (PONA 6) is a qualitative mixture of various gasoline and refinery materials prepared to provide nearly every component that may be encountered in feedstock and finished gasolines. Some oxygenates have been added to allow this blend to be used for DHA method setup.

Contact us for component listing.

Neat, 0.1 mL in Autosampler Vial

cat.# 30723 (ea.)

No data pack available.

DHA PIONA Blend (136 components)

Paraffins		2-methylhexane	0.85%	**Napthenes**	
decane	1.75%	3-methylhexane	0.43%	ctc-123-TMCYC6	0.70%
dodecane	1.75%	2-methylnonane	0.29%	cyclohexane	0.91%
heptane	1.74%	3-methylnonane	0.95%	cyclopentane	1.81%
hexane	1.75%	2-methyloctane	0.22%	*cis*-1,2-dimethylcyclohexane	1.60%
nonane	1.74%	3-methyloctane	1.27%	*trans*-1,2-dimethylcyclohexane	0.68%
octane	1.75%	2-methylpentane	1.15%	*trans*-1,4-dimethylcyclohexane	0.91%
pentadecane	1.74%	3-methylpentane	1.91%	*trans*-1,2-dimethylcyclopentane	0.70%
pentane	1.74%	2,2,3-trimethylbutane	0.12%	*cis*-1,3-dimethylcyclopentane	0.70%
tetradecane	1.75%	2,2,3-trimethylpentane	0.67%	*trans*-1,3-dimethylcyclopentane	1.11%
tridecane	1.74%	**Olefins**		ethylcyclopentane	1.50%
undecane	1.74%	1-decene	0.42%	1-ethyl-1-methylcyclopentane	0.28%
Iso-Paraffins		1-heptene	1.26%	isobutylcyclohexane	0.68%
3,3-diethylpentane	0.35%	*cis*-2-heptene	0.63%	isobutylcyclopentane	0.25%
2,3-dimethylbutane	0.43%	*trans*-2-heptene	0.10%	isopropylcyclohexane	0.90%
2,3-dimethylheptane	0.21%	*cis*-3-heptene	0.63%	isopropylcyclopentane	0.25%
2,5-dimethylheptane	0.68%	*trans*-3-heptene	0.25%	methylcyclohexane	0.70%
3,3-dimethylheptane	0.32%	1-hexene	2.10%	methylcyclopentane	1.13%
3,4-dimethylheptane	0.15%	*cis*-2-hexene	0.43%	*trans*-1-methyl-2-(4MP) cyclopentane	0.68%
3,5-dimethylheptane	0.43%	*trans*-2-hexene	0.42%	*trans*-1-methyl-2-propylcyclohexane	0.92%
2,2-dimethylhexane	0.14%	2-methyl-1,3-butadiene	0.68%	*n*-propylcyclopentane	0.84%
2,3-dimethylhexane	0.62%	2-methyl-1-butene	0.40%	1,1,2-trimethylcyclohexane	0.35%
2,4-dimethylhexane	0.26%	3-methyl-1-butene	0.27%	1,1,4-trimethylcyclohexane	1.20%
2,5-dimethylhexane	1.06%	2-methyl-1-nonene	0.63%	ctc-1,2,4-trimethylcyclohexane	0.20%
2,2-dimethyloctane	0.38%	2-methyl-2-pentene	0.64%	ctt-1,2,4-trimethylcyclohexane	0.35%
3,3-dimethyloctane	0.15%	4-methyl-1-pentene	0.63%	ccc-1,3,5-trimethylcyclohexane	0.45%
2,2-dimethylpentane	0.44%	1-nonene	1.29%	ccc-1,2,3-trimethylcyclopentane	0.15%
2,3-dimethylpentane	0.85%	*trans*-2-nonene	0.43%	ctc-1,2,3-trimethylcyclopentane	0.72%
2,4-dimethylpentane	1.08%	*cis*-3-nonene	0.56%	**Aromatics**	
3,3-dimethylpentane	0.42%	*trans*-3-nonene	0.43%	benzene	1.88%
3-ethylhexane	0.05%	*cis*-4-nonene	0.81%	*n*-butylbenzene	0.47%
3-ethyloctane	0.19%	1-octene	2.11%	*sec*-butylbenzene	0.70%
3-ethylpentane	0.16%	*cis*-2-octene	0.43%	*tert*-butylbenzene	0.47%
isopentane	0.29%	*trans*-2-octene	0.63%	*tert*-1-butyl-3,5-dimethylbenzene	0.76%
3-methylcycloheptane	1.07%	1-pentene	1.63%	1-*tert*-butyl-4-ethylbenzene	0.47%
4-methylcycloheptane	0.26%	*cis*-2-pentene	0.37%	1-*tert*-butyl-2-methylbenzene	0.47%
2-methylheptane	0.85%	*trans*-2-pentene	0.36%	1,2-diethylbenzene	0.19%
				1,2-dimethyl-3-ethylbenzene	0.49%
				1,2-dimethyl-4-ethylbenzene	0.21%
				1,3-dimethyl-2-ethylbenzene	0.18%
				1,3-dimethyl-5-ethylbenzene	0.09%
				1,4-dimethyl-2-ethylbenzene	0.47%
				ethylbenzene	1.87%
				1-ethyl-2-methylbenzene	0.35%
				1-ethyl-3-methylbenzene	0.63%
				1-ethyl-4-methylbenzene	0.47%
				hexylbenzene	1.17%
				isobutylbenzene	0.70%
				isopropylbenzene	0.47%
				2-methylbutylbenzene	0.02%
				1-methyl-2-isopropylbenzene	0.63%
				1-methyl-3-isopropylbenzene	0.24%
				1-methyl-4-isopropylbenzene	0.93%
				1-methyl-2-*n*-propylbenzene	0.49%
				1-methyl-3-*n*-propylbenzene	0.47%
				1-methyl-4-*n*-propylbenzene	0.47%
				pentylbenzene	0.47%
				n-propylbenzene	0.70%
				1,2,4,5-tetramethylbenzene	0.19%
				toluene	2.83%
				1,2,4-triethylbenzene	0.23%
				1,3,5-triethylbenzene	0.47%
				1,2,4-trimethylbenzene	0.47%
				1,3,5-trimethylbenzene	0.09%
				m-xylene	0.70%
				p-xylene	0.24%
				o-xylene	0.71%

Neat, 0.1 mL in Autosampler Vial

cat.# 30712 (ea.)

No data pack available.

Spark Ignition Engine Fuels, *cont.*

ASTM Method D6730-01 (Determination of Individual Components in Spark Ignition Engine Fuels), *cont.*

DHA Paraffins Mix (11 components)

decane	9.11%	pentadecane	9.09%
dodecane	9.13%	pentane	9.06%
heptane	9.08%	tetradecane	9.14%
hexane	9.11%	tridecane	9.05%
nonane	9.08%	undecane	9.05%
octane	9.10%		

Neat, 0.1 mL in Autosampler Vial

cat.# 30713 (ea.)

No data pack available.

DHA Isoparaffins Mix (34 components)

3,3-diethylpentane	1.87%	3-ethylhexane	0.29%
2,3-dimethylbutane	2.27%	3-ethyloctane	1.04%
2,3-dimethylheptane	1.12%	3-ethylpentane	0.85%
2,5-dimethylheptane	3.64%	isopentane	1.53%
3,3-dimethylheptane	1.71%	3-methylcycloheptane	5.73%
3,4-dimethylheptane	0.80%	4-methylcycloheptane	1.41%
3,5-dimethylheptane	2.27%	2-methylheptane	4.54%
2,2-dimethylhexane	0.76%	2-methylhexane	4.54%
2,3-dimethylhexane	3.29%	3-methylhexane	2.28%
2,4-dimethylhexane	1.40%	2-methylnonane	1.53%
2,5-dimethylhexane	5.69%	3-methylnonane	5.10%
2,2-dimethyloctane	2.05%	2-methyloctane	1.20%
3,3-dimethyloctane	0.78%	3-methyloctane	6.81%
2,2-dimethylpentane	2.36%	2-methylpentane	6.17%
2,3-dimethylpentane	4.54%	3-methylpentane	10.23%
2,4-dimethylpentane	5.77%	2,2,3-trimethylbutane	0.64%
3,3-dimethylpentane	2.23%	2,2,3-trimethylpentane	3.56%

Neat, 0.1 mL in Autosampler Vial

cat.# 30715 (ea.)

No data pack available.

DHA Aromatics Mix (38 components)

benzene	8.20%	isopropylbenzene	2.07%
n-butylbenzene	2.06%	2-methylbutylbenzene	0.11%
sec-butylbenzene	3.07%	1-methyl-2-isopropylbenzene	2.76%
tert-butylbenzene	2.04%	1-methyl-3-isopropylbenzene	1.05%
tert-1-butyl-3,5-dimethylbenzene	3.31%	1-methyl-4-isopropylbenzene	4.09%
1-*tert*-butyl-4-ethylbenzene	2.05%	1-methyl-2-*n*-propylbenzene	2.13%
1-*tert*-butyl-2-methylbenzene	2.05%	1-methyl-3-*n*-propylbenzene	2.06%
1,2-diethylbenzene	0.84%	1-methyl-4-*n*-propylbenzene	2.06%
1,2-dimethyl-3-ethylbenzene	2.13%	pentylbenzene	2.05%
1,2-dimethyl-4-ethylbenzene	0.90%	*n*-propylbenzene	3.07%
1,3-dimethyl-2-ethylbenzene	0.79%	1,2,4,5-tetramethylbenzene	0.85%
1,3-dimethyl-5-ethylbenzene	0.39%	toluene	12.36%
1,4-dimethyl-2-ethylbenzene	2.05%	1,2,4-triethylbenzene	1.02%
ethylbenzene	8.18%	1,3,5-triethylbenzene	2.04%
1-ethyl-2-methylbenzene	1.55%	1,2,4-trimethylbenzene	2.05%
1-ethyl-3-methylbenzene	2.77%	1,3,5-trimethylbenzene	0.41%
1-ethyl-4-methylbenzene	2.05%	*m*-xylene	3.08%
hexylbenzene	5.11%	*p*-xylene	1.03%
isobutylbenzene	3.08%	*o*-xylene	3.10%

Neat, 0.1 mL in Autosampler Vial

cat.# 30717 (ea.)

No data pack available.

DHA Naphthenes Mix (27 components)

ctc-123-TMCYC6	3.40%	methylcyclohexane	3.39%
cyclohexane	4.41%	methylcyclopentane	5.48%
cyclopentane	8.75%	*trans*-1-methyl-2-(4MP) cyclopentane	3.31%
cis-1,2-dimethylcyclohexane	7.74%	*trans*-1-methyl-2-propyl cyclohexane	4.43%
trans-1,2-dimethylcyclohexane	3.29%	*n*-propylcyclopentane	4.06%
trans-1,4-dimethylcyclohexane	4.38%	1,1,2-trimethylcyclohexane	1.69%
trans-1,2-dimethylcyclopentane	3.37%	1,1,4-trimethylcyclohexane	5.83%
cis-1,3-dimethylcyclopentane	3.39%	ctc-1,2,4-trimethylcyclohexane	0.98%
trans-1,3-dimethylcyclopentane	5.36%	ctt-1,2,4-trimethylcyclohexane	1.70%
ethylcyclopentane	7.25%	ccc-1,3,5-trimethylcyclohexane	2.16%
1-ethyl-1-methylcyclopentane	1.35%	ccc-1,2,3-trimethylcyclopentane	0.73%
isobutylcyclohexane	3.28%	ctc-1,2,3-trimethylcyclopentane	3.48%
isobutylcyclopentane	1.23%		
isopropylcyclohexane	4.37%		
isopropylcyclopentane	1.20%		

Neat, 0.1 mL in Autosampler Vial

cat.# 30719 (ea.)

No data pack available.

DHA Olefins Mix (26 components)

1-decene	2.27%	2-methyl-2-pentene	3.43%
1-heptene	6.81%	4-methyl-1-pentene	3.41%
cis-2-heptene	3.42%	1-nonene	6.94%
trans-2-heptene	0.52%	*trans*-2-nonene	2.29%
cis-3-heptene	3.41%	*cis*-3-nonene	3.02%
trans-3-heptene	1.37%	*trans*-3-nonene	2.29%
1-hexene	11.30%	*cis*-4-nonene	4.38%
cis-2-hexene	2.30%	1-octene	11.37%
trans-2-hexene	2.26%	*cis*-2-octene	2.32%
2-methyl-1,3-butadiene	3.69%	*trans*-2-octene	3.42%
2-methyl-1-butene	2.18%	1-pentene	8.76%
3-methyl-1-butene	1.48%	*cis*-2-pentene	2.01%
2-methyl-1-nonene	3.42%	*trans*-2-pentene	1.94%

Neat, 0.1 mL in Autosampler Vial

cat.# 30721 (ea.)

No data pack available.

Sulfur in Diesel Fuel

EPA Ultra Low & Low Sulfur Diesel Standards and Samples in Diesel Fuel to Meet EPA Requirements for Lab Qualification

EPA Ultra Low Sulfur Diesel Precision Sample #1

EPA Section 80.580–80.585 Title 40, Chapter 1, Part 80

Homogenous, commercially available diesel fuel with sulfur content of 5–15 ppm.
1 x 200 mL amber bottle.

cat.# 33051 (ea.)

EPA Low Sulfur Diesel Precision Sample #2

EPA Section 80.580–80.585 Title 40, Chapter 1, Part 80

Homogenous, commercially available diesel fuel with sulfur content of 200–500 ppm.
1 x 200 mL amber bottle.

cat.# 33052 (ea.)

EPA Ultra Low Sulfur Diesel Accuracy Standard #1

EPA Section 80.520(a)(1) and 80.510(b)

1–10 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 15 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33053 (ea.)

EPA Ultra Low Sulfur Diesel Accuracy Standard #2

EPA Section 80.520(a)(1) and 80.510(b)

10–20 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 15 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33054 (ea.)

EPA Low Sulfur Diesel Accuracy Standard #3

EPA Section 80.520(c) and 80.510(c)

100–200 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 500 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33055 (ea.)

EPA Low Sulfur Diesel Accuracy Standard #4

EPA Section 80.520(c) and 80.510(c)

400–500 ppm total sulfur in a diesel fuel matrix for motor vehicle diesel and diesel additives subject to the 500 ppm sulfur standard. 1 x 200 mL amber bottle.

cat.# 33056 (ea.)

Ultra Low & Low Sulfur in Diesel Fuel Calibration Kits

EPA Section 80.580–80.585 Title 40, Chapter 1, Part 80

Cal Kit ULSD 1–20

Blank
1.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
2.5 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
5.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
10.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
15.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
20.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
Set of seven 20 mL bottles.

cat.# 33060 (kit) kit

Cal Kit ULSD 20–100

Blank
20.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
35.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
50.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
75.0 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
100 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
Set of six 20 mL bottles.

cat.# 33061 (kit) kit

Cal Kit LSD 100–500

Blank
100 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
200 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
300 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
400 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
500 ppm total sulfur from di-*n*-butylsulfide in diesel fuel
Set of six 20 mL bottles.

cat.# 33062 (kit) kit

Sulfur in Gasoline

Low Sulfur in Gasoline Calibration Standards

EPA Section 80.190–80.415 Title 40, Chapter 1, Part 80

Cal Kit SG 10–50

Blank
10 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
20 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
30 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
40 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
50 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
Set of six 5 mL amber bottles.

cat.# 33043 (kit) **kit**

Check Standard SG 25

25 ppm sulfur from di-*n*-butylsulfide in gasoline by weight. Set of five 5 mL amber bottles.

cat.# 33044 (ea.)

Cal Kit SG 50–125

Blank
50 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
65 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
80 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
95 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
110 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
125 ppm sulfur from di-*n*-butylsulfide in gasoline by weight
Set of seven 5 mL amber bottles.

cat.# 33045 (kit) **kit**

Check Standard SG 75

75 ppm sulfur from di-*n*-butylsulfide in gasoline by weight. Set of five 5 mL amber bottles.

cat.# 33046 (ea.)

Cal Kit SG 110–500

Blank
110 ppm sulfur from di-*n*-butylsulfide
200 ppm sulfur from di-*n*-butylsulfide
300 ppm sulfur from di-*n*-butylsulfide
400 ppm sulfur from di-*n*-butylsulfide
500 ppm sulfur from di-*n*-butylsulfide
Set of six 5 mL amber bottles.

cat.# 33047 (kit) **kit**

Check Standard SG 175

175 ppm sulfur from di-*n*-butylsulfide in gasoline by weight. Set of five 5 mL amber bottles.

cat.# 33048 (ea.)

please note

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and have been verified by one or more analytical methods.

Sulfur in Isooctane

Sulfur in Isooctane Calibration Kits and Check Standards

ASTM Methods D3120, D4045, D5453, D6920

Cal Kit SISO 0.125–2.5 ppm

Blank
0.125 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
0.25 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
0.50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
1.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
2.50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane
0.125–2.5 ppm range. Set of six 1 mL pre-scored ampuls.
cat.# 33035 (kit) **kit**

Check Standard SISO 0.75

0.75 ppm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1 mL pre-scored ampuls.
cat.# 33036 (ea.)

Cal Kit SISO 2.5–50 ppm

Blank
2.50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
5.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
10.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
15.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
20.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
25.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
50.00 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane
2.5–50 ppm range. Set of eight 1 mL pre-scored ampuls.
cat.# 33037 (kit) **kit**

Check Standard SISO 30

30 ppm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1 mL pre-scored ampuls.
cat.# 33038 (ea.)

Cal Kit SISO 50–1000 ppm

Blank
50 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
75 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
100 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
250 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
500 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
1000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane
50–100 ppm range. Set of seven 1 mL pre-scored ampuls.
cat.# 33039 (kit) **kit**

Check Standard SISO 300

300 ppm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1 mL pre-scored ampuls.
cat.# 33040 (ea.)

Sulfur in Isooctane Calibration Kits and Check Standards, *cont.*

Cal Kit SISO 1000–6000

Blank
1000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
1500 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
2000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
4000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
6000 w/w ppm total sulfur from di-*n*-butylsulfide in isooctane
Calibration kit for total sulfur by weight from di-*n*-butylsulfide in isooctane
1000–6000 ppm range. Set of six 1 mL pre-scored ampuls.
cat.# 33041 (kit) **kit**

Check Standard SISO 3000

3000 pm total sulfur by weight from di-*n*-butylsulfide in isooctane.
Set of five 1 mL pre-scored ampuls.
cat.# 33042 (ea.)

Total Sulfur & Total Nitrogen in Isooctane Calibration Kits

ASTM Methods D3120, D4045, D4629, D5453, D5762, D6069, D6920

Cal Kit SNISO 0.125–5.0

Blank
0.125 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
0.25 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
0.50 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
1.00 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
2.50 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
5.00 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
Set of seven 1 mL pre-scored amber ampuls.
cat.# 33057 (kit) **kit**

Cal Kit SNISO 5.0–50.0

Blank
5.00 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
10.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
25.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
50.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
Set of five 1 mL pre-scored amber ampuls.
cat.# 33058 (kit) **kit**

Cal Kit SNISO 50.0–1000

Blank
50.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
75.0 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
100 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
250 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
500 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
1000 w/w ppm total sulfur from thiophene & total nitrogen from pyridine in isooctane
Set of seven 1 mL pre-scored amber ampuls.
cat.# 33059 (kit) **kit**

Sulfur in Mineral Oil

Sulfur in Mineral Oil Calibration Kits and Check Standards

ASTM Methods D2622, D3120, D4045, D4294, D5453, D6445, D7039

Cal Kit SMO 2–20

Blank
2.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
5.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
7.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
10.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
15.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
20.00 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
Set of seven 100 mL bottles.

cat.# 33063 (kit) **kit**

Check Standard SMO 11

11.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil. 1 liter bottle.

cat.# 33064 (ea.)

Cal Kit SMO 10–100

Blank
10.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
25.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
50.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
100 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
Set of five 100 mL bottles.

cat.# 33065 (kit) **kit**

Check Standard SMO 30

30.0 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil. 1 liter bottle.

cat.# 33066 (ea.)

Cal Kit SMO 100–1000

Blank
100 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
200 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
300 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
400 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
500 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
600 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
750 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
1000 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
Set of nine 100 mL bottles.

cat.# 33067 (kit) **kit**

Check Standard SMO 350

350 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil. 1 liter bottle.

cat.# 33068 (ea.)

Cal Kit SMO 1000–25000

Blank
1000 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
2500 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
5000 w/w ppm total sulfur from di-*n*-butylsulfide in mineral oil
1.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
1.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
2.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
2.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
Set of eight 100 mL bottles.

cat.# 33069 (kit) **kit**

Check Standard SMO 3000

3000 w/w ppm total sulfur from di-*n*-butylsulfide. 1 liter bottle.

cat.# 33070 (ea.)

Cal Kit SMO 25000–50000

Blank
2.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
3.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
3.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
4.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
4.50% total sulfur by weight from di-*n*-butylsulfide in mineral oil
5.00% total sulfur by weight from di-*n*-butylsulfide in mineral oil
Set of seven 100 mL bottles.

cat.# 33071 (kit) **kit**

Check Standard SMO 37000

3.70% total sulfur by weight from di-*n*-butylsulfide in mineral oil. 1 liter bottle.

cat.# 33072 (ea.)

please note

These petroleum standards are gravimetrically prepared, NIST-traceable by weight, and have been verified by one or more analytical methods.

Reference Standards

Pharmaceutical

Fatty Acids

Composition of Fatty Acids by GC

EP 2.4.22 Composition of Fatty Acids by GC Mix 1

(6 components)

Description	% by Weight	Description	% by Weight
methyl arachidate (C20:0)	40	methyl oleate (C18:1[*cis*9])	20
methyl dodecanoate (C12:0)	5	methyl palmitate (C16:0)	10
methyl myristate (C14:0)	5	methyl stearate (C18:0)	20

100 mg total

cat.# 35100 (ea.)

No data pack available.

EP 2.4.22 Composition of Fatty Acids by GC Mix 2

(5 components)

Description	% by Weight	Description	% by Weight
methyl caproate (C6:0)	10	methyl dodecanoate (C12:0)	20
methyl caprylate (C8:0)	10	methyl myristate (C14:0)	40
methyl decanoate (C10:0)	20		

100 mg total

cat.# 35101 (ea.)

No data pack available.

Limit of Diethylene & Ethylene Glycol Standards

Meet new FDA Guidance for Industry: Testing of Glycerin for Diethylene Glycol with our new diethylene glycol (DEG) and ethylene glycol limit standards. This guidance emphasizes the importance of screening raw material for the presence of diethylene glycol. Under cGMPs, drug manufacturers—not just glycerin manufacturers—must now test glycerin prior to use to prevent DEG contamination in finished products. FDA has worked extensively with USP to modify the glycerin monograph, and these standards support the revised USP method.

Glycerin Standard Mix (3 components)

diethylene glycol	0.5 mg/mL
ethylene glycol	0.5
glycerin	20

In P&T methanol, 1 mL/ampul

cat.# 31891 (ea.)

Propylene Glycol Standard Mix (3 components)

diethylene glycol	0.5 mg/mL
ethylene glycol	0.5
propylene glycol	20

In P&T methanol, 1 mL/ampul

cat.# 31892 (ea.)

Sorbitol Standard Mix (2 components)

diethylene glycol
ethylene glycol

0.8 mg/mL each in acetone:water (96:4), 1 mL/ampul

cat.# 31893 (ea.)

Glycol Internal Standard Mix

2,2,2-trichloroethanol

10 mg/mL in P&T methanol, 1 mL/ampul

cat.# 31894 (ea.)

Pharmaceutical Compounds in Drinking Water

Pharmaceuticals Mix #1 (8 components)

acetaminophen
caffeine
carbamazepine
ciprofloxacin HCL
erythromycin USP
fluoxetine HCl
sulfamethoxazole
trimethoprim

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 31116 (ea.)

NEW!

Steroids and Mixed Pharmaceuticals Mix

(10 components)

bisphenol A
diclofenac sodium salt
17-beta-estradiol
estrone
17-alpha-ethynylestradiol
4-para-nonylphenol
4-*tert*-octylphenol
primidone
progestrone
testosterone

200 µg/mL each in acetonitrile, 1 mL/ampul
cat.# 31117 (ea.)

NEW!

Pharmaceuticals Mix #2 (4 components)

gemfibrozil
ibuprofen
naproxen
triclosan

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 31118 (ea.)

NEW!

NEW!

Compound Index for Reference Standards

See **pages 730–736.**

Plastic Container Testing

ASTM Method D6042-96 (Plastic Container Testing)

American Society for Testing and Materials (ASTM International) Method D6042-96—Test Method for Determination of Phenolic Antioxidants and Erucamide Slip Additives in Polypropylene Homopolymer Formulations Using Liquid Chromatography—is a "consensus" or "referee" method used among plastic manufacturers and the pharmaceutical companies that purchase plastic containers. Plastic container manufacturers use this test to ensure the quality of their product to their pharmaceutical customers. Pharmaceutical companies also specify this test and provide their own lists of target compounds and concentration limits in purchase agreements.

This test calls for isopropanol extraction, LC separation, and UV detection. Restek offers a variety of reversed phase LC columns suitable for these separations. Restek also designed a reference standard to validate this method. This mixture contains the common antioxidants and slips listed in ASTM D6042-96, along with BHT.

ASTM D6042-96 Calibration Mix (7 components)

BHT
erucamide slip
vitamin E
Irgafos 168
Irganox 3114
Irganox 1010
Irganox 1076

50 µg/mL each in isopropanol, 1 mL/ampul
cat.# 31628 (ea.)

No data pack available.

Other Additives Available From Restek on a Custom Basis

Similar methods for extractables in plastic pharmaceutical containers are cited in the United States Pharmacopeia (USP), British Pharmacopoeia (BP), European Pharmacopoeia (EP), and Japanese Pharmacopoeia (JP). Customers may also have formulation-specific or product-specific test mixtures. Please contact us for a custom mixture. Our current inventory of raw materials includes these popular antioxidants. We have many more not listed and can obtain most compounds you may need. Visit **www.restek.com/solutions** to request yours today!

- Ethanox 323
- Ethanox 330
- Ethanox 702
- Ethanox 703
- Irganox® L06
- Irganox® L57
- Irganox® L64
- Irganox® L109
- Irganox® L134
- Irganox® L135
- Irganox® 1035
- Santanox R
- Ultranox® 626
- Vanlube® 81
- Vanlube® 848
- Vanlube® 7723
- Vanlube® AZ
- Vanlube® NA
- Vanlube® PCX
- Vanlube® SL
- Vanlube® SS

Residual Solvents

USP <467>

The United States Pharmacopeia (USP) General Chapter <467> Residual Solvents is a widely used compendial method intended for identifying and quantifying residual solvents in drug substances, drug products, and excipients. In an attempt to better mirror the International Conference on Harmonization (ICH) guidelines, the USP has adopted a more comprehensive methodology in residual solvent testing—the current USP30/NF25. The ICH publishes a guideline (Q3C) listing the acceptable amounts of solvent residues that can be present. In the ICH guideline, residual solvents are summarized by class according to their toxicity. Class 1 compounds are carcinogenic compounds that pose a risk to both the consumer and the environment. The use of these solvents is to be avoided, but if they are used, they must be tightly controlled. Class 2 compounds are nongenotoxic animal carcinogens, and concentrations of these compounds should be limited. Chromatographic analysis is needed for both the Class 1 and Class 2 residual solvents.

USP <467> Singles

Volume is 1 mL/ampul.

Compound	CAS #	Solvent	Conc.	cat.#
acetonitrile	75-05-8	DMSO	2.05 mg/mL	36281
benzene	71-43-2	DMSO	10 mg/mL	36282
carbon tetrachloride	56-23-5	DMSO	20 mg/mL	36283
chlorobenzene	108-90-7	DMSO	1.8 mg/mL	36284
chloroform	67-66-3	DMSO	0.3 mg/mL	36285
cyclohexane	110-82-7	DMSO	19.4 mg/mL	36286
1,1-dichloroethene	75-35-4	DMSO	40 mg/mL	36287
1,2-dichloroethane	107-06-2	DMSO	25 mg/mL	36288
cis-1,2-dichloroethylene	156-59-2	DMSO	4.67 mg/mL	36289
trans-1,2-dichloroethylene	156-60-5	DMSO	4.67 mg/mL	36290
1,2-dimethoxyethane	173201-80-4	DMSO	0.5 mg/mL	36291
N,N-dimethylacetamide	127-19-5	DMSO	5.45 mg/mL	36292
N,N-dimethylformamide	68-12-2	DMSO	4.4 mg/mL	36293
1,4-dioxane	123-91-1	DMSO	1.9 mg/mL	36294
2-ethoxyethanol	110-80-5	DMSO	0.8 mg/mL	36295
ethylbenzene	100-41-4	DMSO	1.84 mg/mL	36296
ethylene glycol	3775-85-7	DMSO	3.1 mg/mL	36297
formamide	75-12-7	DMSO	1.1 mg/mL	36298
hexane	8031-34-3	DMSO	1.45 mg/mL	36299
methanol	67-56-1	DMSO	15 mg/mL	36401
2-methoxyethanol	109-86-4	DMSO	0.25 mg/mL	36402
methylbutylketone	591-78-6	DMSO	0.25 mg/mL	36400
methylcyclohexane	108-87-2	DMSO	5.9 mg/mL	36403
methylene chloride (dichloromethane)	75-09-2	DMSO	3 mg/mL	36404
N-methylpyrrolidone	872-50-4	DMSO	2.65 mg/mL	36405
nitromethane	75-52-5	DMSO	0.25 mg/mL	36406
pyridine	110-86-1	DMSO	1 mg/mL	36407
sulfolane	126-33-0	DMSO	0.8 mg/mL	36413
tetrahydrofuran (THF)	109-99-9	DMSO	3.6 mg/mL	36408
tetralin	119-64-2	DMSO	0.5 mg/mL	36409
toluene	108-88-3	DMSO	4.45 mg/mL	36410
1,1,1-trichloroethane	71-55-6	DMSO	50 mg/mL	36411
trichloroethene	79-01-6	DMSO	0.4 mg/mL	36412
m-xylene	108-38-3	DMSO	6.51 mg/mL	36414
o-xylene	95-47-6	DMSO	0.97 mg/mL	36415
p-xylene	106-42-3	DMSO	1.52 mg/mL	36416

DMSO = dimethyl sulfoxide

These mixtures reflect the changes made in USP30/NF25 effective July 1, 2008.

Residual Solvents - Class 1 (5 components)

benzene	10 mg/mL
carbon tetrachloride	20
1,2-dichloroethane	25
1,1-dichloroethene	40
1,1,1-trichloroethane	50

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36279 (ea.)

Residual Solvents Class 2 - Mix A (15 components)

acetonitrile	2.05 mg/mL	methylcyclohexane	5.90
chlorobenzene	1.80	methylene chloride	3.00
cyclohexane	19.40	tetrahydrofuran	3.45
cis-1,2-dichloroethene	4.70	toluene	4.45
trans-1,2-dichloroethene	4.70	*m*-xylene	6.51
1,4-dioxane	1.90	*o*-xylene	0.98
ethylbenzene	1.84	*p*-xylene	1.52
methanol	15.00		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36271 (ea.)

Residual Solvents Class 2 - Mix B (8 components)

chloroform	60 µg/mL	nitromethane	50
1,2-dimethoxyethane	100	pyridine	200
n-hexane (C6)	290	tetralin	100
2-hexanone	50	trichloroethene	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36280 (ea.)

Residual Solvents Class 2 - Mix C (8 components)

2-ethoxyethanol	800 µg/mL	2-methoxyethanol (methyl Cellosolve)	250
ethylene glycol	3,100	N-methylpyrrolidone	2,650
formamide	1,100	sulfolane	800
N,N-dimethylacetamide	5,450		
N,N-dimethylformamide	4,400		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36273 (ea.)

Residual Solvents, *cont.*

USP <467>, *cont.*

The Class 1 mixtures below reflect the requirements of USP23/NF18 effective January 1, 1995 to December 31, 1999. While these mixtures do not meet the current USP guidelines, many still use these mixtures to obtain a detectable benzene peak for the direct injection methods, Method I and Method V.

USP <467> Calibration Mixture #3 (5 components)

benzene	100 µg/mL	methylene chloride	500
chloroform	50	trichloroethene	100
1,4-dioxane	100		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36004 (ea.)

USP <467> Calibration Mixture #4 (5 components)

benzene	2 µg/mL	methylene chloride	600
chloroform	60	trichloroethene	80
1,4-dioxane	380		

In methanol, 1 mL/ampul

cat.# 36006 (ea.)

USP <467> Calibration Mixture #5 (5 components)

benzene	2 µg/mL	methylene chloride	600
chloroform	60	trichloroethene	80
1,4-dioxane	380		

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36007 (ea.)

USP <467> Calibration Mix #6 (4 components)

chloroform	60 µg/mL	methylene chloride	600
1,4-dioxane	380	trichloroethene	80

In methanol, 1 mL/ampul

cat.# 36008 (ea.)

USP <467> Calibration Mix #7 (4 components)

chloroform	60 µg/mL	methylene chloride	600
1,4-dioxane	380	trichloroethene	80

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36009 (ea.)

OVI retention index

For a list of OVI retention times, see **pages 683–684**.

Ethylene Oxide

The test for ethylene oxide is specified in many individual drug monographs of USP24/NF19. The limit test concentration is currently 10 ppm. While the specific test solution and method will vary depending on the particular drug monograph, the solution below is suitable for most tests. Call Technical Service or your local Restek representative if your test requires a different ethylene oxide solution.

500 µg/mL in dimethyl sulfoxide, 1 mL/ampul

cat.# 36005 (ea.)

50 mg/mL in methylene chloride, 1 mL/ampul

cat.# 30620 (ea.)

Ethylene oxide is available in other solvents and concentrations. Request your custom formulation at **www.restek.com/solutions**

Residual Solvents, *cont.*

European Pharmacopoeia Method

Residual Solvents - Class 1 (5 components)

benzene	10 mg/mL
carbon tetrachloride	20
1,2-dichloroethane	25
1,1-dichloroethene	40
1,1,1-trichloroethane	50

In dimethyl sulfoxide, 1 mL/ampul

cat.# 36279 (ea.)

European Pharmacopoeia/ICH Q3C(M) Class 2 Mix A, Revised (14 components)

chlorobenzene	360 µg/mL	methylene chloride	600
cyclohexane	3,880	tetrahydrofuran	720
cis-1,2-dichloroethene	1,870	toluene	890
N,N-dimethylformamide	880	trichloroethene	80
ethylbenzene	369	*m*-xylene	1,302
n-hexane (C6)	290	*o*-xylene	195
methylcyclohexane	1,180	*p*-xylene	304

In dimethyl sulfoxide, 1 mL/ampul

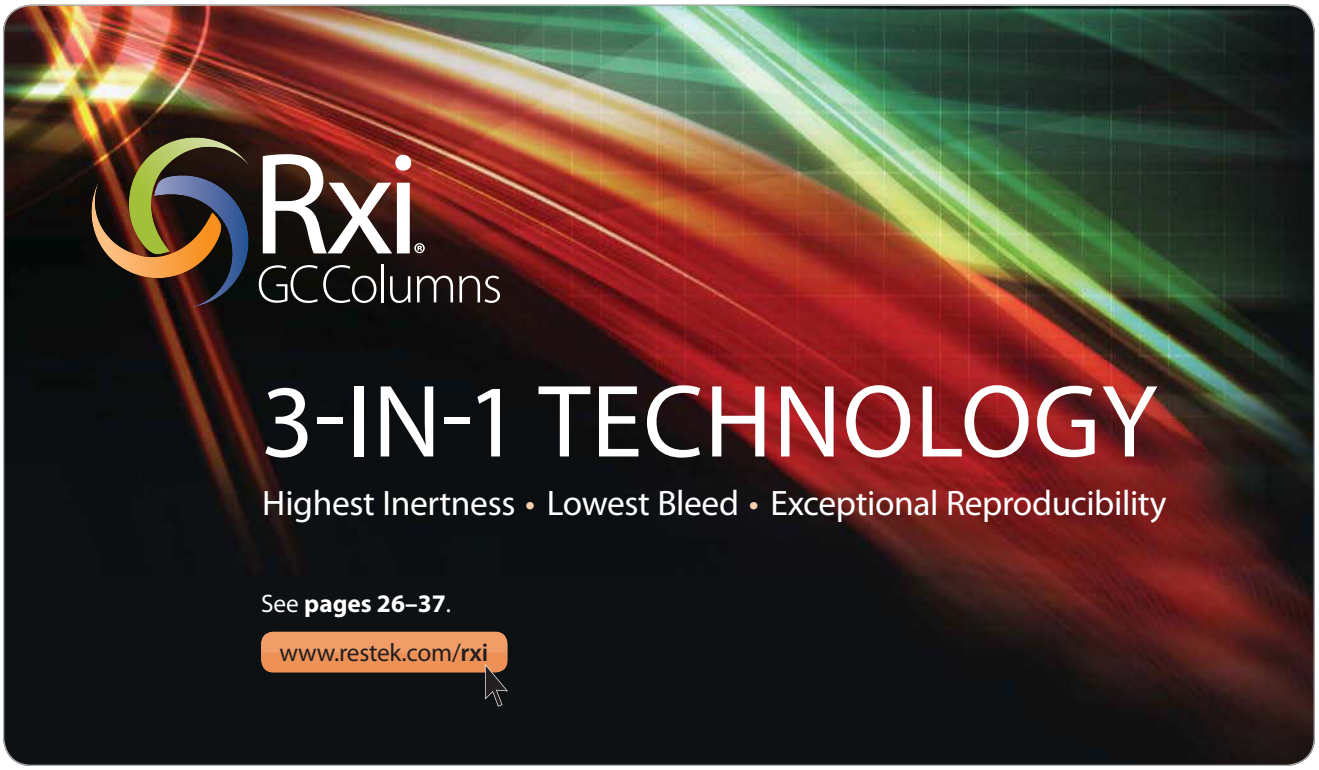
cat.# 36274 (ea.)

European Pharmacopoeia/ICH Class 2 Mix B, Revised (10 components)

acetonitrile	410 µg/mL	2-hexanone	50
chloroform	60	methanol	3,000
1,2-dimethoxyethane	100	nitromethane	50
N,N-dimethylacetamide	1,090	pyridine	200
1,4-dioxane	380	tetralin	100

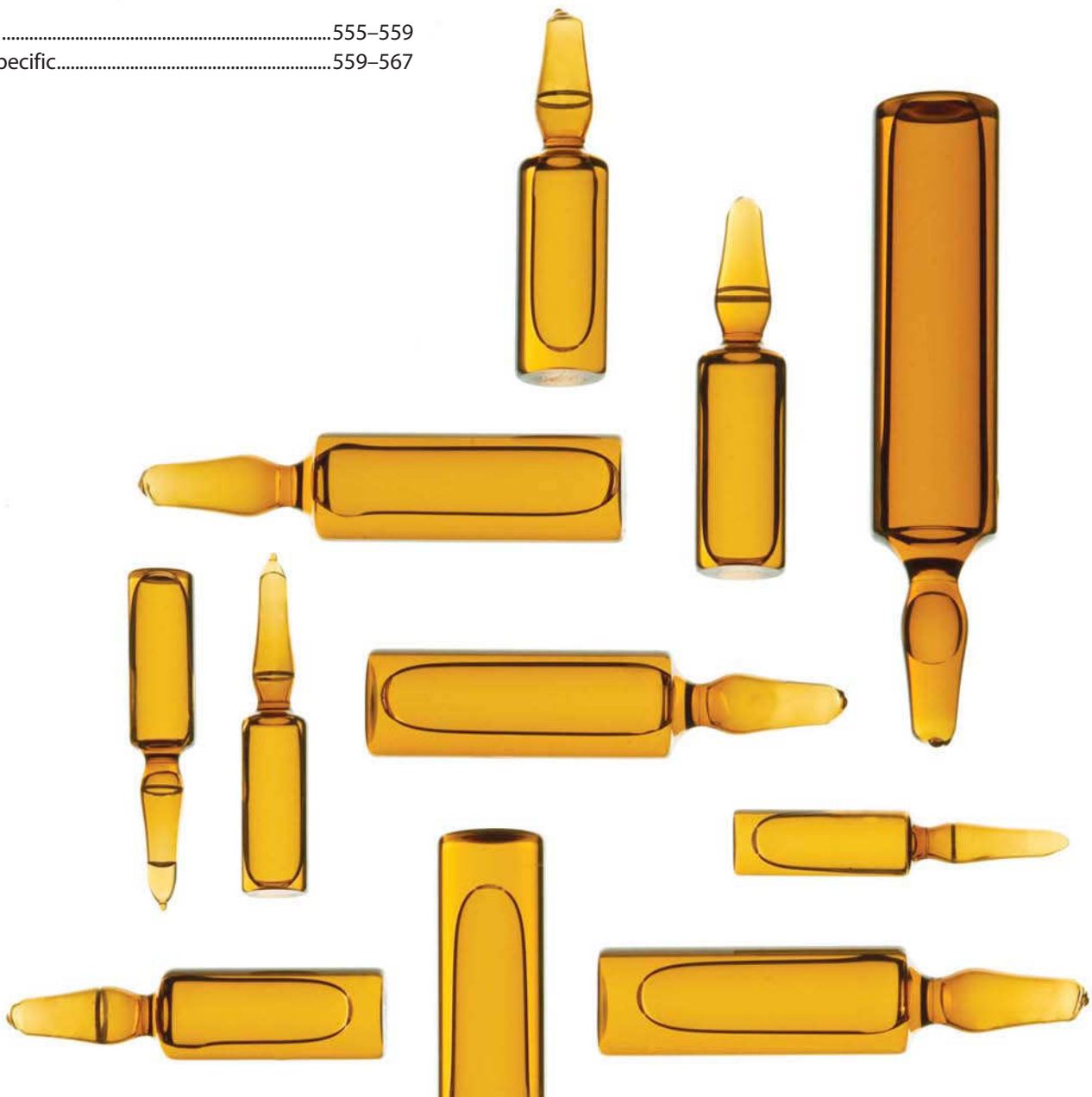
Prepared in water:dimethyl sulfoxide (80:20), 1 mL/ampul

cat.# 36270 (ea.)



Reference Standards

Leaking Underground Storage Tank (LUST) Recovery Act Program Methods



General

Retention Time Standards

Used during initial sample screening to determine retention time windows for each petroleum product. Gasoline generally elutes in the window from C6 to C10 (or C12), and diesel fuel from C10 (or C12) to C24 (or C28). Retention above C24 (or C28) indicates oil or lubricant contamination.

Leaking Underground Storage Tank Retention Time Standard (7 components)

n-hexane (C6)
n-decane (C10)
n-dodecane (C12)
n-tetracosane (C24)
n-octacosane (C28)
n-triacontane (C30)
n-tetracontane (C40)

25 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31200 (ea.)

Retention Time Marker Standard (3 components)

n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31637 (ea.)

Retention Time Marker (3 components)

n-hexane (C6)
n-decane (C10)
n-dodecane (C12)

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30483 (ea.)

TNRCC 1005 Retention Time Markers Mix

(4 components)

- Easily determine the retention time window for each boiling point range.
- Prepared in *n*-pentane according to EPA requirements.

n-hexane (C6)
n-dodecane (C12)
n-octacosane (C28)
n-pentatriacontane (C35)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31698 (ea.)

Retention Time Marker - Alaska (4 components)

n-hexane (C6)
n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31819 (ea.)

Restek Offers a Full Line of Certified Reference Materials
See **pages 438–439**.
QUALITY ISO 9001 • 17025 • Guide 34
www.restek.com/iso

Fuel Composite Standards

Unleaded Gasoline Composite Standard

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul
cat.# 30206 (ea.)

Diesel Fuel #2 Composite Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31259 (ea.)

Kerosene Composite Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31257 (ea.)

Motor Oil Composite Standards

Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31464 (ea.)

Used Motor Oil Composite Standard

Prepared from an equal-volume blend from five gasoline-powered vehicles (belonging to Restek employees). After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31465 (ea.)

also available

Other fuels, oils, and lubricant oils available on request as custom products.

General, *cont.*

Single-Source Fuels

Unleaded Gasoline Standard

Prepared from a single-source (one-refinery) product.

unleaded gasoline: unweathered

5,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30096 (ea.)

Kerosene Standard

Prepared from a single-source (one-refinery) product.

kerosene: unweathered

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31229 (ea.)

Diesel Fuel #2 Standard

Prepared from a single-source (one-refinery) product.

diesel fuel #2: unweathered

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31233 (ea.)

Fuel Oil #4 Standard

Fuel oil #4 is typically used in limited applications in which the fuel cannot be preheated prior to burning. The fuel is a blend of distillate (fuel oil #2) and residual (fuel oil #6) to meet ASTM viscosity specifications. Fuel oil #4 used to prepare this mixture has a kinematic viscosity of 21.9 at 38 °C (100 °F) measured using ASTM D-445.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31216 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31244 (ea.)

Fuel Oil #5 Standard

Fuel oil #5 is typically used in applications in which there is little or no preheating of the fuel prior to burning. A blend of distillate (fuel oil #2) and residual (fuel oil #6), the fuel oil #5 used to prepare this mixture has a kinematic viscosity of 106.5 at 38 °C (100 °F) measured using ASTM D-445.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31217 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31246 (ea.)

Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31248 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31249 (ea.)

Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

Aviation Gas Standard

100-octane, low-lead fuel used in piston-type aircraft.

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30094 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30207 (ea.)

Jet Fuel A Standard

Commercial jet fuel A.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31215 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31242 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31243 (ea.)

Creosote Oil Standard

Creosote oil, a widely used wood preservative produced by distilling coal tar, contains chemicals that are classified as carcinogens (e.g., benzo(a)pyrene).

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31838 (ea.)

Hydraulic Oil Standard

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31839 (ea.)

General, *cont.*

Military Fuels (Jet Propellant)

JP-4 Military Fuel Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31219 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31250 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30472 (ea.)

JP-5 Military Fuel Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31220 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31252 (ea.)

JP-8 Military Fuel Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31262 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31254 (ea.)

Fuel Oil Degradation Test

Subsurface degradation of fuel oil spills can be estimated by examining the ratios of C17/pristane and C18/phytane.[1] To assist in identifying these four compounds from the complex fuel oil analysis, we offer a product that contains these compounds for retention time determination.

Fuel Oil Degradation Mix (4 components)

heptadecane (C17)
octadecane (C18)
pristane (2,6,10,14-tetramethylpentadecane)
phytane (2,6,10,14-tetramethylhexadecane)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31240 (ea.)

[1]Interpretation of Gas Chromatographic Data in Subsurface Hydrocarbon Investigations, R. Senn and M. Johnson, Ground Water Monitoring Review, Winter 1987.

Mineral Spirits

There are four general types of mineral spirits, classified according to boiling point range (BPR):

- Type I (Stoddard solvent) BPR 149–182 °C
- Type II (high flash point) BPR 177–196 °C
- Type III (odorless) BPR 149–196 °C
- Type IV (low dry point) BPR 149–174 °C

We prepare our solutions from an equal-volume blend of Type I, II, and III mineral spirits.

Mineral Spirits Standards (Unweathered)

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31225 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31260 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31261 (ea.)

Stoddard Solvent Standard

Stoddard solvent is also known as Type I mineral spirits, Texsolve S, or Varsol® 1 mineral spirits. We offer this reference material for those who need to calibrate Stoddard solvent separately. This standard is dissolved in methanol for analysis by either direct injection or purge-and-trap.

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30487 (ea.)

General, *cont.*

Petroleum Volatile Organic Compounds (PVOCs), Gasoline Range Organics (GRO) & Benzene-Toluene-Ethylbenzene-Xylenes (BTEX)

PVOC Mix (California) (7 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30231 (ea.)

PVOC/GRO Mix (Wisconsin) (10 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30095 (ea.)

GRO Mix (9 components)

benzene
ethylbenzene
3-methylpentane
naphthalene
toluene
1,2,4-trimethylbenzene
2,2,4-trimethylpentane (isooctane)
m-xylene
o-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30069 (ea.)

GRO Mix (EPA) (9 components)

benzene	500 µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500		

In P&T methanol, 1 mL/ampul
cat.# 30065 (ea.)

Gasoline Component Standard (10 components)

benzene	500 µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500	*p*-xylene	1,000

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

BTEX Standard (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

200 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30051 (ea.)

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30213 (ea.)

2,000 µg/mL each in P&T methanol (*m*- & *p*-xylene at 1,000 µg/mL), 1 mL/ampul
cat.# 30488 (ea.)

BTEX Gas Mix (6 components)

benzene
ethylbenzene
toluene
m-xylene
o-xylene
p-xylene

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34414 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi
cat.# 26361 (ea.)

1 ppm in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34414-PI (ea.)

100 ppb in nitrogen, 104 liters @ 1,800 psi
cat.# 34428 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi
cat.# 26362 (ea.)

100 ppb in nitrogen, 110 liters @ 1,800 psi (Pi-marked cylinder)
cat.# 34428-PI (ea.)

No data pack available.

See page 425 for regulators.

cylinder design

Spectra (Linde)
104 L Cylinders:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide)
110 L Cylinders:
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

Certified BTEX in Unleaded Gas Composite Standard (9 components)

Certified for:
benzene*
ethylbenzene*
isopropyl benzene*
methyl *tert*-butyl ether (MTBE)*
naphthalene*
toluene*
m-xylene*
o-xylene*
p-xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30237 (ea.)

*Concentration differs from lot to lot. See online certificate of analysis for certified concentrations.

Certified Aromatics in Gasoline (16 components)

Certified for:
benzene*
ethylbenzene*
m-ethyltoluene*
o-ethyltoluene*
p-ethyltoluene*
isopropylbenzene*
methyl *tert*-butyl ether (MTBE)*
naphthalene*
n-propylbenzene*
toluene*
1,2,3-trimethylbenzene*
1,2,4-trimethylbenzene*
1,3,5-trimethylbenzene*
m-xylene*
o-xylene*
p-xylene*

5,500 ppm gasoline in P&T methanol, 1 mL/ampul
cat.# 30485 (ea.)

*Concentration differs from lot to lot. See online certificate of analysis for certified concentrations.

Certified PAHs in Diesel (7 components)

Certified for:
acenaphthene*
acenaphthylene*
fluorene*
1-methylnaphthalene*
2-methylnaphthalene*
naphthalene*
phenanthrene*

50,000 ppm diesel #2 in methylene chloride, 1 mL/ampul
cat.# 31673 (ea.)

*Concentration differs from lot to lot. See online certificate of analysis for certified concentrations.

General, *cont.*

Gasoline Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
4-bromofluorobenzene	460-00-4	PTM	2,500	30067
4-bromofluorobenzene	460-00-4	PTM	10,000	30082
1-chlorooctane	111-85-3	PTM	10,000	30084
α,α,α-trifluorotoluene	98-08-8	PTM	2,500	30068
α,α,α-trifluorotoluene	98-08-8	PTM	10,000	30083
Recommended Internal Standard (PID) for EPA GRO Method				
1-chloro-4-fluorobenzene	352-33-0	PTM	2,500	30066

PTM = Purge-and-trap grade methanol

Diesel Surrogate and Internal Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
1-chlorooctadecane	3386-33-2	D	10,000	31098
2-fluorobiphenyl	321-60-8	D	10,000	31096
o-terphenyl	84-15-1	D	10,000	31097
p-terphenyl	92-94-4	D	10,000	31095
Recommended Internal Standards				
5-α-androstane	438-22-2	D	2,000	31065
o-terphenyl	84-15-1	A	2,000	31066

A = acetone; D = methylene chloride

Diesel/Biodiesel Standard

Diesel:Biodiesel (80:20) Blend Standard

The biodiesel component is methyl soyate.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31880 (ea.)

also available

ASTM Method D6584-10 and EN14105 Biodiesel Standards

See **page 539.**

State-Specific Methods

Alaska

Alaska Department of Environmental Conservation (ADEC) regulations indicate which products and indicator compounds are to be tested for each petroleum range. The analyst must use the following Alaska Series Methods or appropriate SW-846 Method for the indicator compounds. The Alaska UST procedurals manual indicates which products are to be tested for each petroleum range.

AK101

Method for determination of aromatic and aliphatic hydrocarbons in gasoline range organics.

Retention Time Marker - Alaska (4 components)

n-hexane (C6)
n-decane (C10)
n-pentacosane (C25)
n-hexatriacontane (C36)

1,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31819 (ea.)

Alaska UST Method AK101AA (14 components)

benzene
ethylbenzene
1-ethyl-2-methylbenzene
1-ethyl-3-methylbenzene
1-ethyl-4-methylbenzene
isopropylbenzene
n-propylbenzene
toluene
1,2,3-trimethylbenzene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30461 (ea.)

Unleaded Gasoline Composite Standard

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30081 (ea.)

50,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30205 (ea.)

50,000 µg/mL in P&T methanol, 5 mL/ampul
cat.# 30206 (ea.)

1-Chloro-4-fluorobenzene Mix

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30066 (ea.)

4-Bromofluorobenzene Mix

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30026 (ea.)

α,α,α-Trifluorotoluene

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30083 (ea.)

State-Specific Methods, *cont.*

Alaska, *cont.*

AK102

Method for determination of aromatic and aliphatic hydrocarbons in diesel range organics.

DRO Mix (Tennessee/Mississippi) (16 components)

n-decane (C10)
n-undecane (C11)
n-dodecane (C12)
n-tridecane (C13)
n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)
n-heptadecane (C17)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tricosane (C23)
n-tetracosane (C24)
n-pentacosane (C25)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31214 (ea.)

Kerosene Composite Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31094 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31256 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31257 (ea.)

Diesel Fuel #2 Composite Standard

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31093 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31258 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31259 (ea.)

o-Terphenyl

2,000 µg/mL in acetone, 1 mL/ampul
cat.# 31066 (ea.)

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31097 (ea.)

5-α-Androstane

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31065 (ea.)

AK103

Method for determination of aromatic and aliphatic hydrocarbons in residual range organics.

Residual Range Calibration Standard (RCS) (2 components)

SAE30 motor oil:SAE40 motor oil (1:1)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31817 (ea.)

Residual Range Calibration Verification Standard (CVS) (2 components)

SAE30 motor oil:SAE40 motor oil (1:1)

25,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31818 (ea.)

Motor Oil Composite Standard

Prepared from an equal-volume blend of 5W30, 10W30, 10W40, and 20W50 motor oils. After blending, a precisely weighed amount of the composite is added to a volumetric flask to produce the standard.

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31464 (ea.)

Fuel Oil #6 Standard

This fuel, sometimes called bunker C or residual, is a black viscous oil. Applications in which it may be used require the ability to preheat the fuel prior to pumping and burning.

5,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31218 (ea.)

50,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31248 (ea.)

50,000 µg/mL in methylene chloride, 5 mL/ampul
cat.# 31249 (ea.)

n-Triacontane-d62

500 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31816 (ea.)

Surrogate Standard Mixture (3 components)

squalane
o-terphenyl
tetrahydronaphthol

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31638 (ea.)

State-Specific Methods, *cont.*

Arizona

Extraction Retention Time Standard (4 components)

n-hexane (C6)
n-decane (C10)
n-docosane (C22)
n-dotriacontane (C32)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31830 (ea.)

DRO/GRO Calibration Standard (2 components)

10W30 motor oil:diesel fuel #2 (1:1 blend)

25,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31831 (ea.)

DRO/GRO Range Calibration Standard (12 components)

n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31832 (ea.)

o-Terphenyl

2,000 µg/mL in acetone, 1 mL/ampul
cat.# 31066 (ea.)

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31097 (ea.)

Los Angeles County, CA Well Investigation Program (WIP)*

*For monitoring samples suspected of gasoline contamination, Los Angeles County requires laboratories to calibrate and report these compounds.

CA WIP VOA Standard (11 components)

benzene
chlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30236 (ea.)

California

PVOC Mix (California) (7 components)

benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
toluene
m-xylene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30231 (ea.)

California Oxygenates Mix (5 components)

diisopropyl ether (DIPE)	2,000 µg/mL	*tert*-butyl alcohol	10,000
ethyl-*tert*-butyl ether (ETBE)	2,000	methyl *tert*-butyl ether (MTBE)	2,000
tert-amyl methyl ether (TAME)	2,000		

In P&T methanol, 1 mL/ampul
cat.# 30465 (ea.)

Methanol

10,000 µg/mL in DI water, 1 mL/ampul
cat.# 30467 (ea.)

15 mg/mL in dimethyl sulfoxide, 1 mL/ampul
cat.# 36401 (ea.)

Ethanol

10,000 µg/mL in DI water, 1 mL/ampul
cat.# 30466 (ea.)

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30288 (ea.)

Glycols Standard (2 components)

ethylene glycol
propylene glycol

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

Connecticut

Connecticut ETPH Calibration Mixture (15 components)

n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31614 (ea.)

NEW! Compound Index for Reference Standards

See **pages 730–736.**

State-Specific Methods, *cont.*

Florida

Florida TRPH Standard (17 components)

n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)
n-octatriacontane (C38)
n-tetracontane (C40)

500 µg/mL each in hexane, 1 mL/ampul
cat.# 31266 (ea.)

2,000 µg/mL each in carbon disulfide, 1 mL/ampul*
cat.# 31878 (ea.)

*Ground transportation shipments only.

Florida TRPH Surrogate Mix

n-nonatriacontane (C39)

3,000 µg/mL in carbon disulfide, 1 mL/ampul*
cat.# 31456 (ea.)

3,000 µg/mL in carbon disulfide, 10 mL/ampul*
cat.# 31877 (ea.)

*Ground transportation shipments only.

Massachusetts

MA VPH Standard With Surrogate Rev. 1.1 (July 2004)

(16 components)

benzene
n-butylcyclohexane
n-decane (C10)
2,5-dibromotoluene (SS)
ethylbenzene
2-methylpentane
methyl *tert*-butyl ether (MTBE)
naphthalene
n-nonane (C9)
n-pentane (C5)
toluene
1,2,4-trimethylbenzene
2,2,4-trimethylpentane (isooctane)
m-xylene
o-xylene
p-xylene

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30604 (ea.)

MA VPH Matrix Spike Mix With Surrogate Rev. 1.1 (July 2004) (16 components)

benzene
n-butylcyclohexane
n-decane (C10)
2,5-dibromotoluene (SS)
ethylbenzene
2-methylpentane
methyl *tert*-butyl ether (MTBE)
naphthalene
n-nonane (C9)
n-pentane (C5)
toluene
1,2,4-trimethylbenzene
2,2,4-trimethylpentane (isooctane)
m-xylene
o-xylene
p-xylene

50 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30605 (ea.)

Massachusetts, *cont.*

MA Volatile Petroleum Hydrocarbon (VPH) Standard

(13 components)

n-pentane (C5)	1,000 µg/mL	naphthalene	1,000
n-nonane (C9)	1,000	toluene	1,500
benzene	500	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	*m*-xylene	1,000
isooctane	1,500	*o*-xylene	1,000
2-methylpentane	1,500	*p*-xylene	1,000
methyl *tert*-butyl ether (MTBE)	1,500		

In P&T methanol, 1 mL/ampul
cat.# 30434 (ea.)

MA VPH Standard With Surrogate (14 components)

n-pentane (C5)	1,000 µg/mL	methyl *tert*-butyl ether (MTBE)	1,500
n-nonane (C9)	1,000	naphthalene	1,000
benzene	500	toluene	1,500
2,5-dibromotoluene (SS)	1,000	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	*m*-xylene	1,000
isooctane	1,500	*o*-xylene	1,000
2-methylpentane	1,500	*p*-xylene	1,000

In P&T methanol, 1 mL/ampul
cat.# 30452 (ea.)

MA VPH Matrix Spike Mix With Surrogate

(14 components)

n-pentane (C5)
n-nonane (C9)
benzene
2,5-dibromotoluene (SS)
ethylbenzene
isooctane
2-methylpentane
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,4-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,500 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30454 (ea.)

MA VPH Surrogate Standard

2,5-dibromotoluene

1,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30435 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30453 (ea.)

State-Specific Methods, *cont.*

Massachusetts, *cont.*

Massachusetts APH Mix (26 components)

benzene
1,3-butadiene
butylcyclohexane
cyclohexane
n-decane
2,3-dimethylheptane
2,3-dimethylpentane
n-dodecane
ethylbenzene
n-heptane
n-hexane
isopentane
isopropylbenzene
p-isopropyltoluene
methyl *tert*-butyl ether
1-methyl-3-ethylbenzene
naphthalene
n-nonane
n-octane
toluene
1,2,3-trimethylbenzene
1,3,5-trimethylbenzene
n-undecane
o-xylene
m/*p*-xylene (combined)

cylinder design

Spectra (Linde)
104 L Cylinders:
Aluminum construction
Size: 8 x 24 cm
Volume/Pressure:
104 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 1.5 lb/0.7 kg

Scotty (Air Liquide)
110 L Cylinders:
Aluminum construction
Size: 8.3 x 29.5 cm
Volume/Pressure:
110 liters of gas @ 1,800 psi
CGA-180 outlet fitting.
Weight: 2.2 lb/1 kg
U.S. DOT Specs: 3AL2216

1 ppm in nitrogen, 104 liters @ 1,800 psi
cat.# 34540 (ea.)

100 ppb in nitrogen, 110 liters @ 1,500psi
cat.# 26366 (ea.)

NEW!

100 ppb in nitrogen, 110 liters @ 1,500 psig (Pi-marked cylinder)
cat.# 34540-PI (ea.)

No data pack available.

Gas standards are subject to hazardous materials shipping fees by most freight carriers. All calibration gas standards are nonreturnable due to DOT hazardous shipping requirements.

MA EPH Aromatic Hydrocarbon Standard

(17 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31458 (ea.)

MA EPH Aliphatic Hydrocarbon Standard

(14 components)

n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-hexatriacontane (C36)

1,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31459 (ea.)

MA EPH Matrix Spike Mix (10 components)

n-nonane (C9)
n-tetradecane (C14)
n-nonadecane (C19)
n-eicosane (C20)
n-octacosane (C28)
acenaphthene
anthracene
chrysene
naphthalene
pyrene

250 µg/mL each in acetone, 1 mL/ampul
cat.# 31460 (ea.)

5-α-Androstane

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31065 (ea.)

MA EPH Surrogate Spike Mix (2 components)

1-chlorooctadecane
o-terphenyl

4,000 µg/mL each in acetone, 1 mL/ampul
cat.# 31479 (ea.)

1-Chlorooctadecane

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31098 (ea.)

Naphthalene-d8

2,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31043 (ea.)

MA Fractionation Surrogate Spike Mix (2 components)

2-bromonaphthalene
2-fluorobiphenyl

4,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31480 (ea.)

MA Fractionation Check Mix (31 components)

PAHs:
acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene

Hydrocarbons:
n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-hexatriacontane (C36)

25 µg/mL each in hexane, 1 mL/ampul
cat.# 31481 (ea.)

State-Specific Methods, *cont.*

Michigan

Michigan GRO Mix (14 components)

benzene
1,2-dibromoethane
1,2-dichloroethane
ethylbenzene
isopropylbenzene
2-methylnaphthalene
methyl *tert*-butyl-ether (MTBE)
naphthalene
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30468 (ea.)

Mississippi

DRO Mix (Tennessee/Mississippi) (16 components)

n-decane (C10)
n-undecane (C11)
n-dodecane (C12)
n-tridecane (C13)
n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)
n-heptadecane (C17)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tricosane (C23)
n-tetracosane (C24)
n-pentacosane (C25)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31214 (ea.)

Gasoline Component Standard (10 components)

benzene	500 µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500	*p*-xylene	1,000

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

New Jersey

NJDEP EPH 10/08 Rev. 2 Aliphatics Calibration Standard (20 components)

n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)
n-octatriacontane (C38)
n-tetracontane (C40)
2-methylnaphthalene
naphthalene

2,000 µg/mL each in hexane:carbon disulfide (80:20), 1 mL/ampul
cat.# 30540 (ea.)

New Jersey, *cont.*

NJDEP EPH 10/08 Rev. 2 Aromatics Calibration Standard (18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene
1,2,3-trimethylbenzene

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 30541 (ea.)

NJDEP EPH 10/08 Rev. 2 Aliphatics Matrix Spike Mix (18 components)

n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)
n-octatriacontane (C38)
n-tetracontane (C40)

200 µg/mL each in pentane, 5 mL/ampul
cat.# 30542 (ea.)

NJDEP EPH 10/08 Rev. 2 Aromatics Matrix Spike Mix (18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene
1,2,3-trimethylbenzene

200 µg/mL each in acetone:toluene (50:50), 5 mL/ampul
cat.# 30543 (ea.)

NJDEP EPH 10/08 Rev. 2 Aliphatics Fractionation Check Mix (18 components)

n-nonane (C9)
n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)
n-triacontane (C30)
n-dotriacontane (C32)
n-tetratriacontane (C34)
n-hexatriacontane (C36)
n-octatriacontane (C38)
n-tetracontane (C40)

400 µg/mL each in hexane, 5 mL/ampul
cat.# 30544 (ea.)

State-Specific Methods, *cont.*

New Jersey, *cont.*

NJDEP EPH 10/08 Rev. 2 Aromatics Fractionation Check Mix (16 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(ghi)perylene
benzo(k)fluoranthene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
phenanthrene
pyrene
1,2,3-trimethylbenzene

400 µg/mL each in hexane:toluene (50:50), 5 mL/ampul
cat.# 30545 (ea.)

Northwest U.S. Regional Method (Oregon & Washington)

Also see Washington, page 567.

Glycols Standard (2 components)

ethylene glycol
propylene glycol

50,000 µg/mL each in DI water, 1 mL/ampul
cat.# 30471 (ea.)

NW TPH-Dx Surrogate Mix Standards

Volume is 1 mL/ampul. Concentration is µg/mL.

Compound	CAS #	Solvent	Conc.	cat.#
2-fluorobiphenyl	321-60-8	D	10,000	31096
o-terphenyl	84-15-1	D	10,000	31097
p-terphenyl	92-94-4	D	10,000	31095
pentacosane (C25)	629-99-2	D	10,000	31487

D = methylene choride

Pennsylvania

PA DEP UST Standard (11 components)

benzene
1,2-dibromoethane
1,2-dichloroethane
ethylbenzene
isopropyl benzene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
m-xylene
o-xylene
p-xylene

2,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30433 (ea.)

Tennessee/Mississippi

DRO Mix (Tennessee/Mississippi) (16 components)

n-decane (C10)
n-undecane (C11)
n-dodecane (C12)
n-tridecane (C13)
n-tetradecane (C14)
n-pentadecane (C15)
n-hexadecane (C16)
n-heptadecane (C17)
n-octadecane (C18)
n-nonadecane (C19)
n-eicosane (C20)
n-heneicosane (C21)
n-docosane (C22)
n-tricosane (C23)
n-tetracosane (C24)
n-pentacosane (C25)

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31214 (ea.)

Gasoline Component Standard (10 components)

benzene	500 µg/mL	1,2,4-trimethylbenzene	1,000
ethylbenzene	500	2,2,4-trimethylpentane	1,500
heptane	500	*m*-xylene	1,000
2-methylpentane	1,500	*o*-xylene	1,000
toluene	1,500	*p*-xylene	1,000

10,000 µg/mL total in P&T methanol, 1 mL/ampul
cat.# 30486 (ea.)

State-Specific Methods, *cont.*

Texas

Texas TNRCC Method 1006

TNRCC 1006 Retention Time Marker Mix (9 components)

n-hexane (C6)
n-heptane (C7)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-octacosane (C28)
n-pentatriacontane (C35)

200 µg/mL in pentane, 1 mL/ampul
cat.# 31814 (ea.)

Texas TNRCC Method 1005

TNRCC 1005 Retention Time Markers Mix
(4 components)

n-hexane (C6)
n-dodecane (C12)
n-octacosane (C28)
n-pentatriacontane (C35)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31698 (ea.)

TX TPH Locator Mix (3 components)

n-hexane (C6)
n-decane (C10)
n-octacosane (C28)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31482 (ea.)

TX TPH Calibration Mix (2 components)

diesel fuel #2 composite
unleaded gasoline composite

10,000 µg/mL each in pentane, 1 mL/ampul
cat.# 31483 (ea.)

TX TPH Matrix Spike Mix (2 components)

diesel fuel #2 composite
unleaded gasoline composite

10,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 31484 (ea.)

Texas TNRCC Method 1005, *cont.*

Alternate Boiling Point/Carbon Number Distribution Marker Stock Standard (9 components)

n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-octacosane (C28)
n-pentatriacontane (C35)
n-hexatriacontane (C36)

200 µg/mL each in pentane, 1 mL/ampul
cat.# 31639 (ea.)

α,α,α-Trifluorotoluene

2,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30048 (ea.)

2,500 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30068 (ea.)

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30083 (ea.)

1-Chlorooctane

10,000 µg/mL in P&T methanol, 1 mL/ampul
cat.# 30084 (ea.)

1-Chlorooctadecane

10,000 µg/mL in methylene chloride, 1 mL/ampul
cat.# 31098 (ea.)

State-Specific Methods, *cont.*

Washington

Also see Northwest U.S. Regional Method, page 565.

WA VPH Marker Standard (9 components)

n-pentane (C5)
n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
1-methylnaphthalene
naphthalene
toluene
1,2,3-trimethylbenzene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30450 (ea.)

WA VPH Standard (15 components)

n-pentane (C5)
n-hexane (C6)
n-octane (C8)
n-decane (C10)
n-dodecane (C12)
benzene
ethylbenzene
1-methylnaphthalene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,3-trimethylbenzene
m-xylene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30451 (ea.)

WA EPH Aromatic Hydrocarbon Mix (6 components)

acenaphthene
benzo(ghi)perylene
naphthalene
pyrene
toluene
1,2,3-trimethylbenzene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31488 (ea.)

WA EPH Aliphatic Hydrocarbon Mix (6 components)

n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-tetratriacontane (C34)

1,000 µg/mL each in hexane, 1 mL/ampul
cat.# 31489 (ea.)

WA EPH Aromatic Hydrocarbon Standard (18 components)

acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
2-methylnaphthalene
naphthalene
phenanthrene
pyrene
1,2,3-trimethylbenzene

1,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31469 (ea.)

WA EPH Matrix Spike Mix (10 components)

n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
acenaphthene
anthracene
benzo(a)pyrene
benzo(ghi)perylene
naphthalene
pyrene

250 µg/mL each in acetone, 1 mL/ampul
cat.# 31490 (ea.)

Washington, *cont.*

WA EPH Fractionation Check Mix (22 components)

n-octane (C8)
n-decane (C10)
n-dodecane (C12)
n-hexadecane (C16)
n-heneicosane (C21)
n-tetratriacontane (C34)
acenaphthene
acenaphthylene
anthracene
benzo(a)anthracene
benzo(a)pyrene
benzo(b)fluoranthene
benzo(k)fluoranthene
benzo(ghi)perylene
chrysene
dibenzo(a,h)anthracene
fluoranthene
fluorene
indeno(1,2,3-cd)pyrene
naphthalene
phenanthrene
pyrene

25 µg/mL each in hexane, 1 mL/ampul
cat.# 31491 (ea.)

Wisconsin

PVOC/GRO Mix (Wisconsin) (10 components)

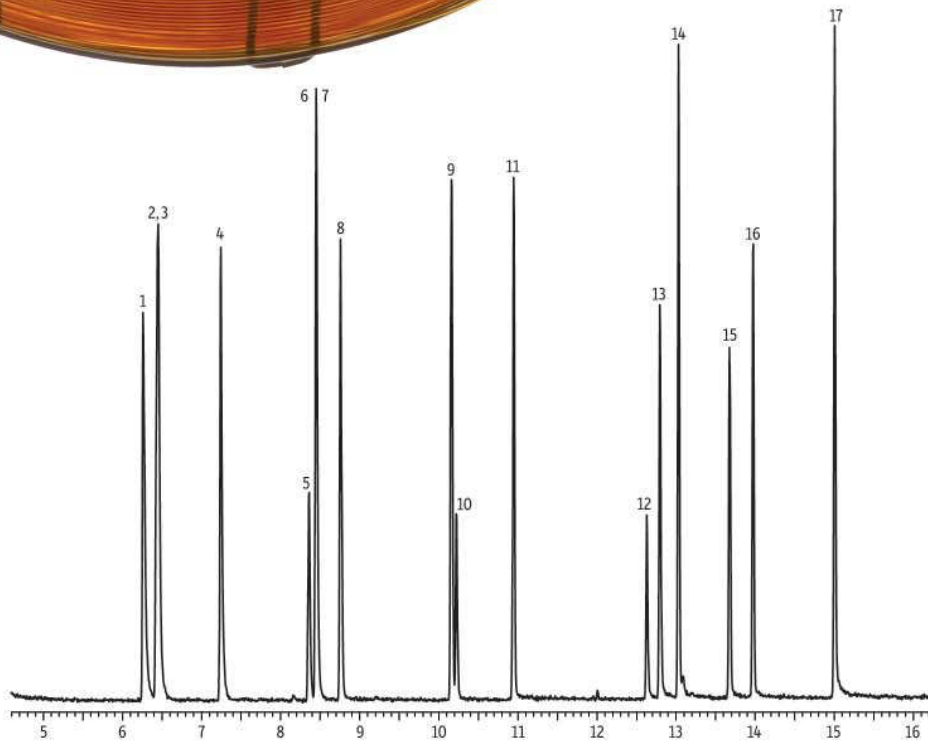
benzene
ethylbenzene
methyl *tert*-butyl ether (MTBE)
naphthalene
toluene
1,2,4-trimethylbenzene
1,3,5-trimethylbenzene
m-xylene
o-xylene
p-xylene

1,000 µg/mL each in P&T methanol, 1 mL/ampul
cat.# 30095 (ea.)

DRO Mix (EPA/Wisconsin) (10 components)

n-decane (C10)
n-dodecane (C12)
n-tetradecane (C14)
n-hexadecane (C16)
n-octadecane (C18)
n-eicosane (C20)
n-docosane (C22)
n-tetracosane (C24)
n-hexacosane (C26)
n-octacosane (C28)

2,000 µg/mL each in methylene chloride, 1 mL/ampul
cat.# 31064 (ea.)


1
2,3
4
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11
12
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14
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16
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16


2
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11

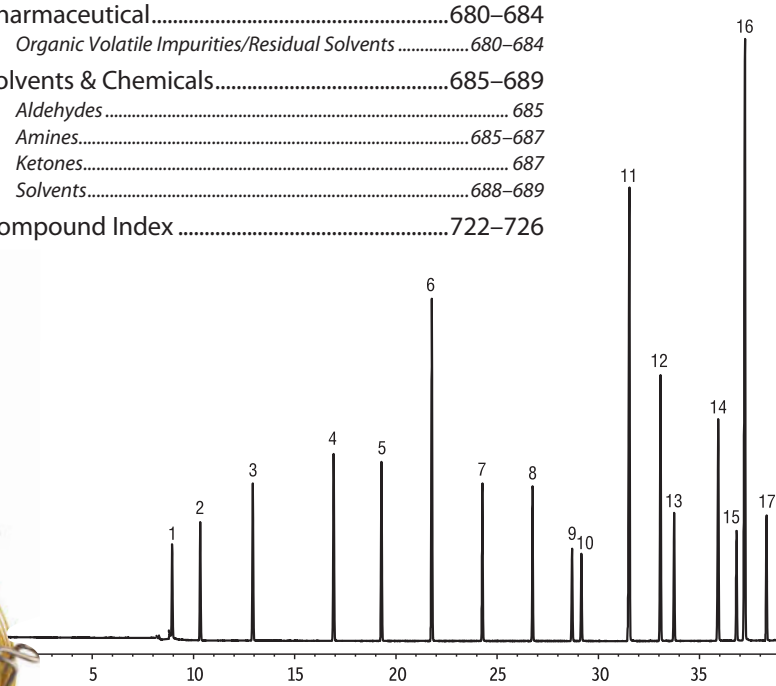
Chromatograms

GC Chromatograms

LC Chromatograms

Compound Index

GC Chromatograms



GC Chromatograms by Column Phase

FUSED SILICA

GC Chromatograms by Column Phase, *cont'd*

PACKED

PACKED/MICROPACKED

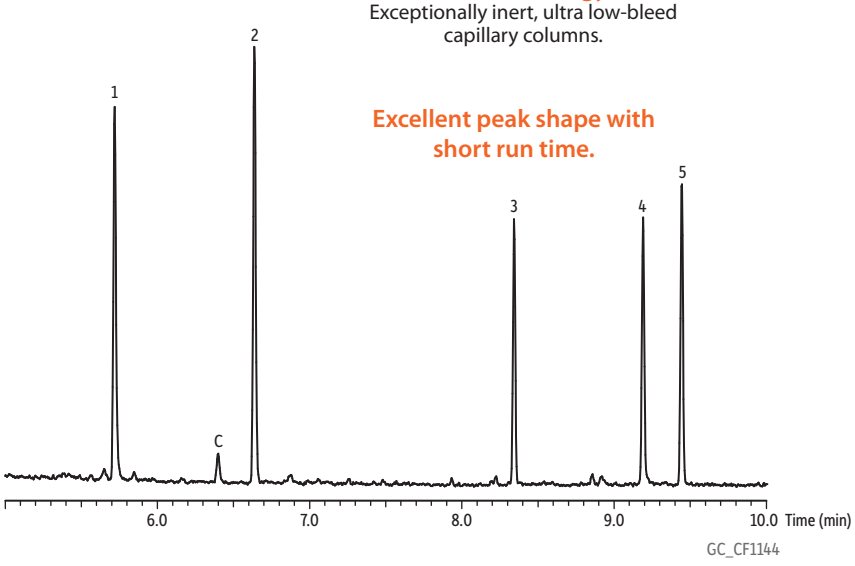
PLOT

EPA Methods Chart

Derivatized Amphetamines (500 ng/mL) on Rxi®-5Sil MS

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

Excellent peak shape with short run time.



GC_CF1144

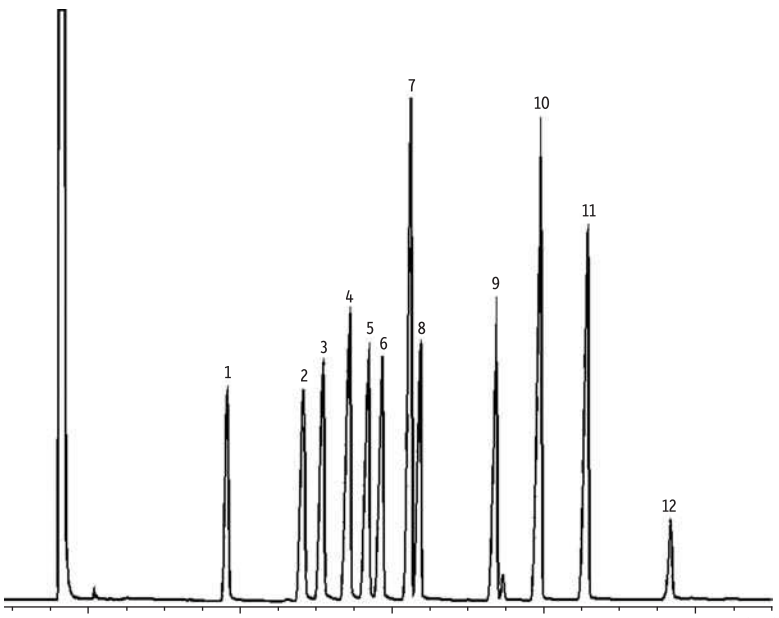
Peaks
1. Amphetamine
2. Methamphetamine
3. MDA
4. MDMA
5. MDEA

c = contaminant

Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	
Diluent:	Butyl chloride
Conc.:	500 ng/mL HFAA derivatives
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	3.5 mm splitless taper w/wool (cat.# 22286-200.1)
Inj. Temp.:	250 °C
Purge Flow:	28 mL/min
Oven	
Oven Temp:	75 °C to 300 °C at 15 °C/min
Carrier Gas	He, constant linear velocity
Linear Velocity:	45 cm/sec, 13.5 psi, 93.1 kPa @ 75 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	250 °C
Analyzer Type:	Quadrupole
Source Temp.:	200 °C
Electron Energy:	70 eV
Solvent Delay Time:	4 min
Tune Type:	PFTBA
Ionization Mode:	EI
Scan Range:	40-300 amu
Scan Rate:	5 scans/sec
Instrument	Shimadzu 2010 GC & QP2010+ MS

Underivatized Barbiturates (Acidic/Neutral Drugs) on Rtx®-35

Separation optimized using Pro *ez*GC!



GC_PH00267

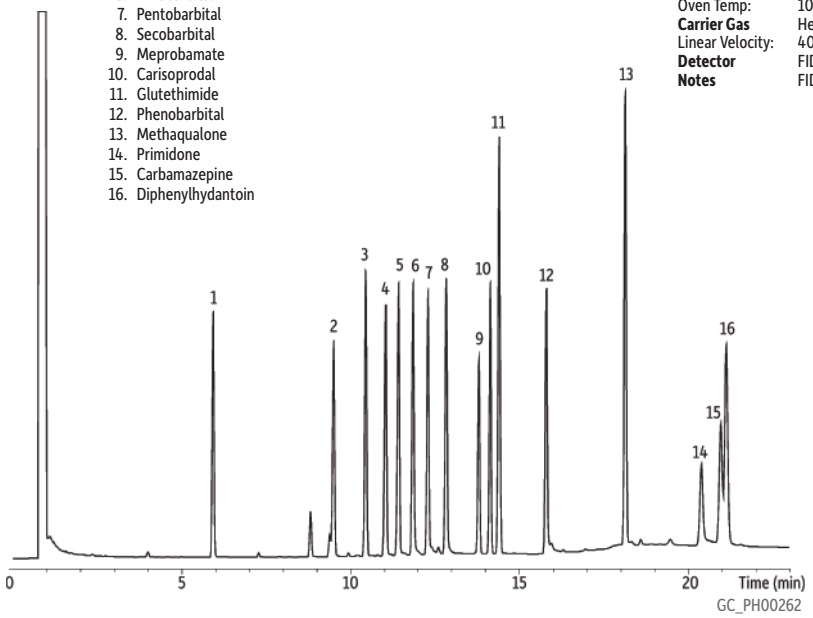
Peaks
1. Barbital
2. Aprobarbital
3. Butalbital
4. Amobarbital
5. Talbutal
6. Pentobarbital
7. Methohexital
8. Secobarbital
9. Thiopental
10. Hexobarbital
11. Mephobarbital
12. Phenobarbital

Column	Rtx®-35, 30 m, 0.32 mm ID, 0.50 µm (cat.# 10439)
Sample	Barbiturates
Injection	
Inj. Vol.:	1.0 µL split (split ratio 30:1)
Inj. Temp.:	300 °C
Oven	
Oven Temp:	210 °C (hold 2 min) to 300 °C at 7 °C/min (hold 2 min)
Carrier Gas	He, constant pressure
Linear Velocity:	35 cm/sec @ 210 °C
Detector	FID @ 300 °C
Notes	FID sensitivity: 5.12 x 10^{-10} AFS

Underivatized Barbiturates (Acidic/Neutral Drugs) on Rtx®-35

Peaks
1. Ethosuximide
2. Barbital
3. Methyprylon
4. Aprobarbital
5. Butalbital
6. Amobarbital
7. Pentobarbital
8. Secobarbital
9. Meprobamate
10. Carisoprodal
11. Glutethimide
12. Phenobarbital
13. Methaqualone
14. Primidone
15. Carbamazepine
16. Diphenylhydantoin

Column	Rtx®-35, 30 m, 0.53 mm ID, 1.00 µm (cat.# 10455)
Sample	Acidic/neutral drugs
Conc.:	50 µg/mL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.5 min)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C to 280 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant pressure
Linear Velocity:	40 cm/sec @ 100 °C
Detector	FID @ 250 °C
Notes	FID sensitivity: 5.12 x 10^{-10} AFS

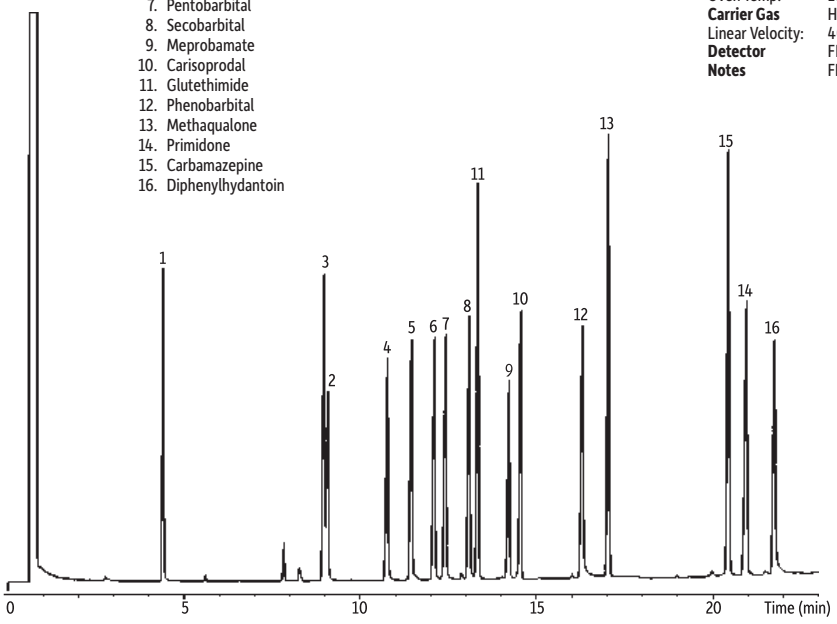


GC_PH00262

Underivatized Barbiturates (Acidic/Neutral Drugs) on Rtx®-1701

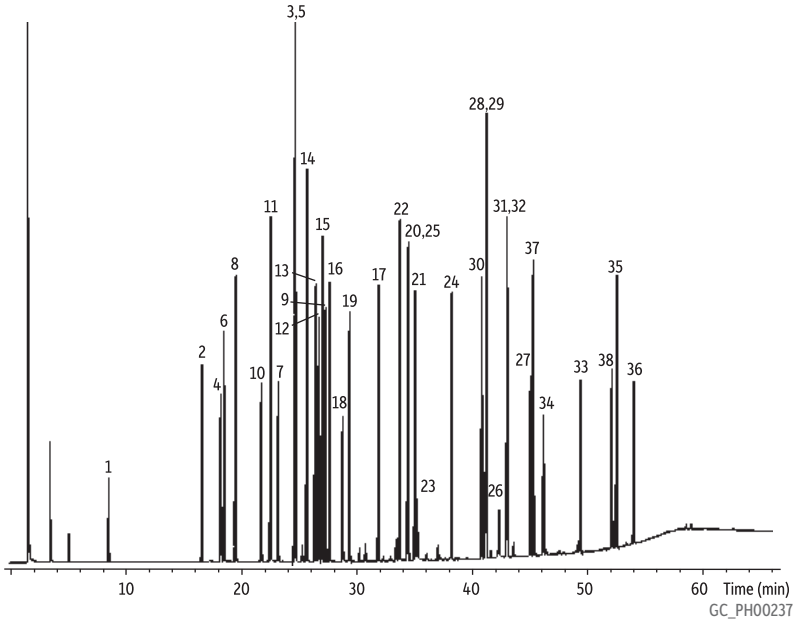
Peaks
1. Ethosuximide
2. Barbital
3. Methyprylon
4. Aprobarbital
5. Butalbital
6. Amobarbital
7. Pentobarbital
8. Secobarbital
9. Meprobamate
10. Carisoprodal
11. Glutethimide
12. Phenobarbital
13. Methaqualone
14. Primidone
15. Carbamazepine
16. Diphenylhydantoin

Column	Rtx®-1701, 15 m, 0.53 mm ID, 0.50 µm (cat.# 12037)
Sample	Acidic/neutral drugs
Conc.:	50 µg/mL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.5 min)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C to 280 °C at 7 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	40 cm/sec @ 100 °C
Detector	FID @ 275 °C
Notes	FID sensitivity: 5.12 x 10^{-10} AFS



GC_PH00263

Underivatized Mixed Basic Drugs on Rtx®-200

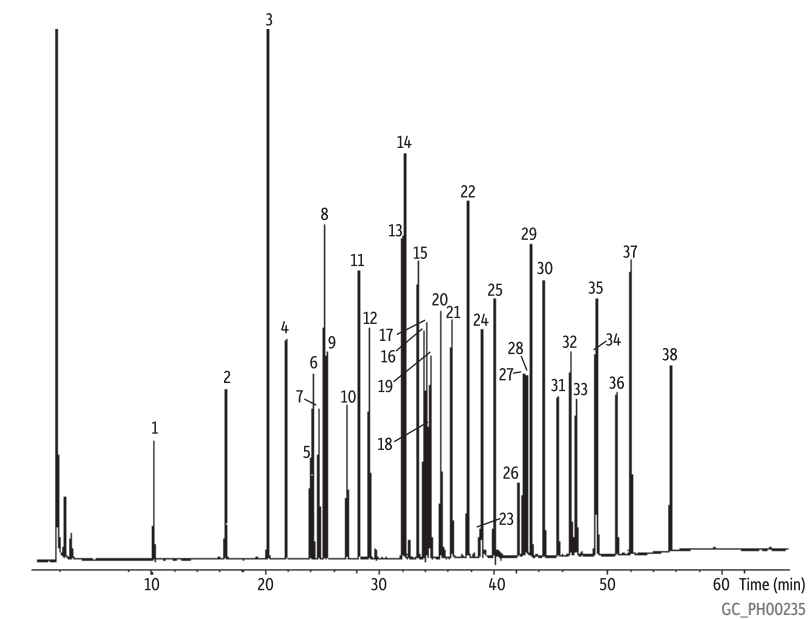


GC_PH00237

Peaks
1. Nicotine
2. Benzocaine
3. Cotinine
4. Meperidine
5. Caffeine
6. Benzphetamine
7. Ketamine
8. Diphenhydramine
9. Lidocaine
10. Phenyltoloxamine
11. Tripelennamine
12. Phenothiazine
13. Dextromethorphan
14. Methadone
15. Amitriptyline
16. Trimipramine
17. Tetracaine
18. Pyrilamine
19. Medazepam
20. Bupivacaine
21. Scopolamine
22. Codeine
23. Morphine
24. Diazepam
25. Chlorpromazine
26. Temazepam
27. Flunitrazepam
28. Bromazepam
29. Prazepam
30. Acetopromazine
31. Flurazepam
32. Papaverine
33. Clonazepam
34. Haloperidol
35. Alprazolam
36. Triazolam
37. Thioridazine
38. Trazodone

Column	Rtx®-200, 30 m, 0.25 mm ID, 0.25 µm (cat.# 15023)
Sample	Basic drug sample
Conc.:	1,000 ng/µL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 50:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C to 325 °C at 4 °C/min (hold 10 min)
Carrier Gas	He, constant pressure
Linear Velocity:	30 cm/sec @ 100 °C
Detector	FID @ 320 °C
Notes	FID sensitivity: 1.28 x 10^{-10} AFS

Underivatized Mixed Basic Drugs on Rtx®-5

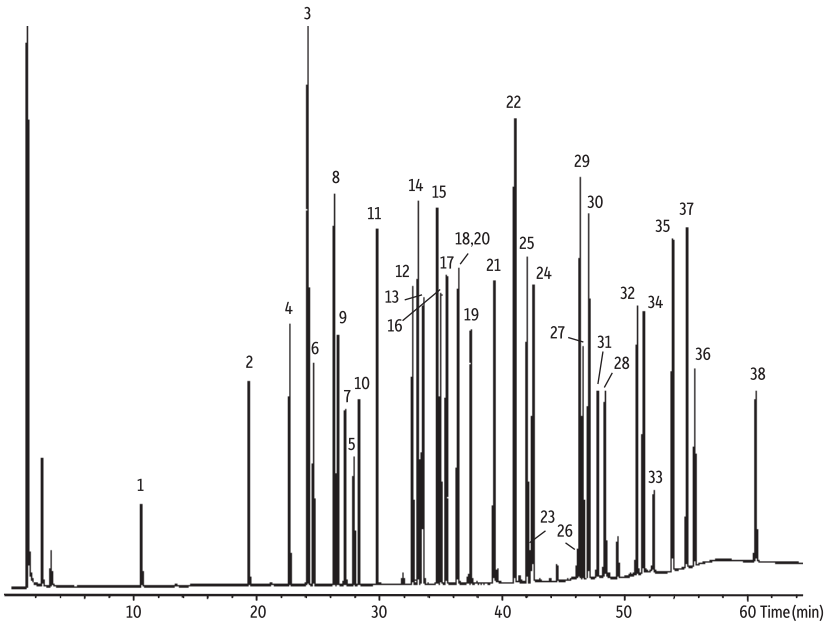


GC_PH00235

Peaks
1. Nicotine
2. Benzocaine
3. Cotinine
4. Meperidine
5. Caffeine
6. Benzphetamine
7. Ketamine
8. Diphenhydramine
9. Lidocaine
10. Phenyltoloxamine
11. Tripelennamine
12. Phenothiazine
13. Dextromethorphan
14. Methadone
15. Amitriptyline
16. Trimipramine
17. Tetracaine
18. Pyrilamine
19. Medazepam
20. Bupivacaine
21. Scopolamine
22. Codeine
23. Morphine
24. Diazepam
25. Chlorpromazine
26. Temazepam
27. Flunitrazepam
28. Bromazepam
29. Prazepam
30. Acetopromazine
31. Flurazepam
32. Papaverine
33. Clonazepam
34. Haloperidol
35. Alprazolam
36. Triazolam
37. Thioridazine
38. Trazodone

Column	Rtx®-5, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10223)
Sample	Basic drug sample
Conc.:	1,000 ng/µL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 50:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C to 325 °C at 4 °C/min (hold 10 min)
Carrier Gas	He, constant pressure
Linear Velocity:	30 cm/sec @ 100 °C
Detector	FID @ 320 °C
Notes	FID sensitivity: 1.28 x 10^{-10} AFS

Underivatized Mixed Basic Drugs on Rtx®-35

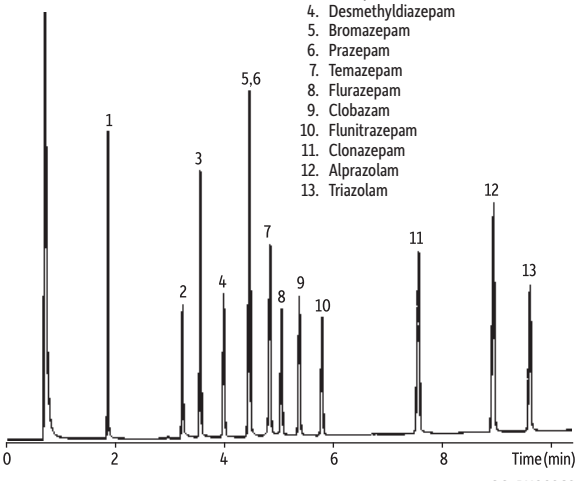


GC_PH00236

Peaks
1. Nicotine
2. Benzocaine
3. Cotinine
4. Meperidine
5. Caffeine
6. Benzphetamine
7. Ketamine
8. Diphenhydramine
9. Lidocaine
10. Phenyltoloxamine
11. Tripelennamine
12. Phenothiazine
13. Dextromethorphan
14. Methadone
15. Amitriptyline
16. Trimipramine
17. Tetracaine
18. Pyrilamine
19. Medazepam
20. Bupivacaine
21. Scopolamine
22. Codeine
23. Morphine
24. Diazepam
25. Chlorpromazine
26. Temazepam
27. Flunitrazepam
28. Bromazepam
29. Prazepam
30. Acetopromazine
31. Flurazepam
32. Papaverine
33. Clonazepam
34. Haloperidol
35. Alprazolam
36. Triazolam
37. Thioridazine
38. Trazodone

Column	Rtx®-35, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10423)
Sample	Basic drug sample
Conc.:	1,000 ng/µL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 50:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C to 325 °C at 4 °C/min (hold 10 min)
Carrier Gas	He, constant pressure
Linear Velocity:	30 cm/sec @ 100 °C
Detector	FID @ 320 °C
Notes	FID sensitivity: 1.28 x 10^{-10} AFS

Benzodiazepines (Underivatized) on Rtx®-200



GC_PH00268

Peaks
1. Medazepam
2. Lorazepam
3. Diazepam
4. Desmethyldiazepam
5. Bromazepam
6. Prazepam
7. Temazepam
8. Flurazepam
9. Clobazam
10. Flunitrazepam
11. Clonazepam
12. Alprazolam
13. Triazolam

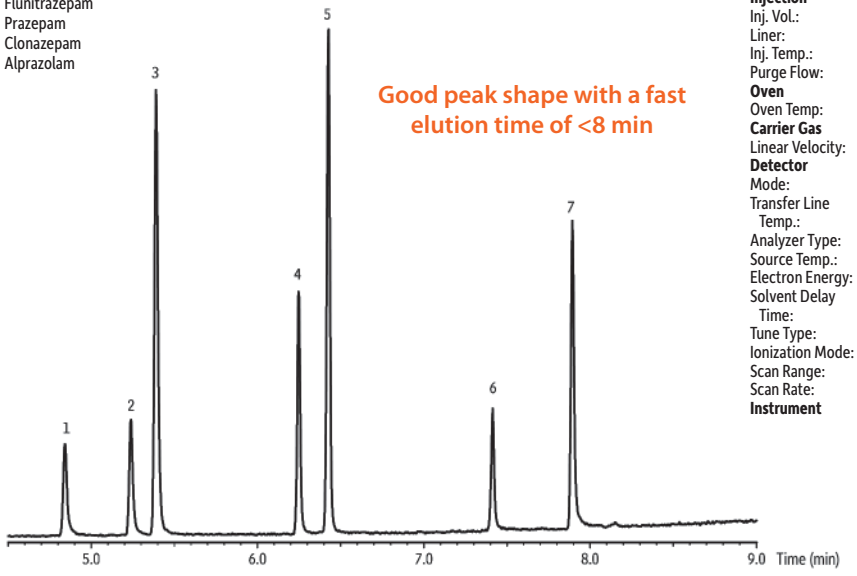
Column	Rtx®-200, 15 m, 0.32 mm ID, 0.25 µm (cat.# 15021)
Sample	Benzodiazepines
Conc.:	15 ng each component
Injection	
Inj. Vol.:	1.0 µL split (split ratio 60:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	225 °C to 325 °C at 8 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	35 cm/sec @ 225 °C
Detector	FID @ 320 °C
Notes	FID sensitivity: 5.12 x 10^{-10} AFS

Benzodiazepines (15 µg/mL) on Rxi®-5Sil MS

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

Peaks
1. Oxazepam
2. Lorazepam
3. Diazepam
4. Flunitrazepam
5. Prazepam
6. Clonazepam
7. Alprazolam

Good peak shape with a fast elution time of <8 min



GC_CF1148

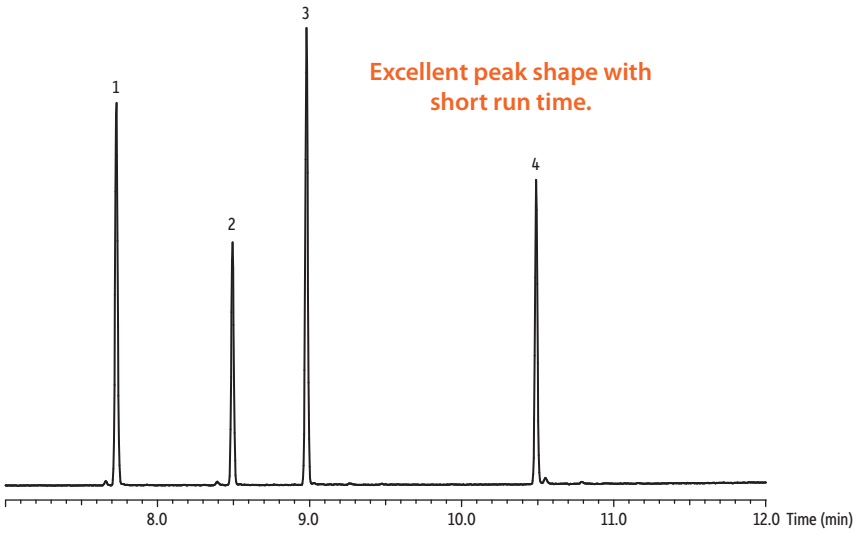
Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	
Diluent:	Butyl chloride
Conc.:	15 µg/mL
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	3.5 mm splitless taper w/wool (cat.# 22286-200.1)
Inj. Temp.:	280 °C
Purge Flow:	32.2 (20:1 split) mL/min
Oven	
Oven Temp:	200 °C to 330 °C at 15 °C/min (hold 3 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	50 cm/sec, 23.7 psi, 163.4 kPa @ 200 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	200 °C
Electron Energy:	70 eV
Solvent Delay Time:	4 min
Tune Type:	PFTBA
Ionization Mode:	EI
Scan Range:	50-350 amu
Scan Rate:	5 scans/sec
Instrument	Shimadzu 2010 GC & QP2010+ MS

Derivatized Cannabinoids (5 µg/mL) on Rxi®-5Sil MS

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

Peaks
1. Cannabidiol
2. delta 9 THC
3. Cannabinol
4. THC-COOH; THCA

Excellent peak shape with short run time.

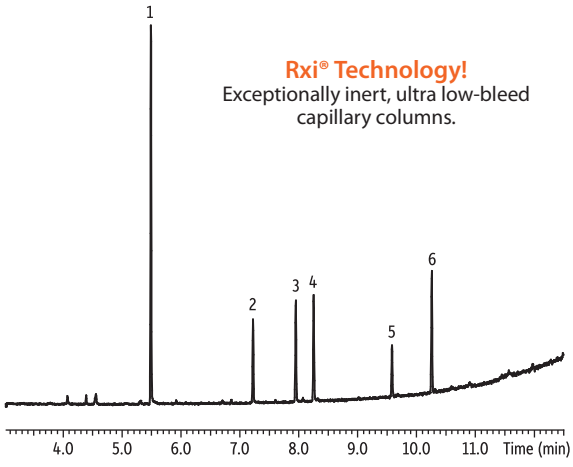


GC_CF1145

Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	
Diluent:	Ethyl acetate
Conc.:	5 µg/mL TMS derivatives
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	3.5 mm splitless taper w/wool (cat.# 22286-200.1)
Inj. Temp.:	250 °C
Purge Flow:	21.4 mL/min
Oven	
Oven Temp:	150 °C to 330 °C at 15 °C/min (hold 3 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	40 cm/sec, 13.8 psi, 95.1 kPa @ 150 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	200 °C
Electron Energy:	70 eV
Solvent Delay Time:	4 min
Tune Type:	PFTBA
Ionization Mode:	EI
Scan Range:	200-500 amu
Scan Rate:	5 scans/sec
Instrument	Shimadzu 2010 GC & QP2010+ MS

Cocaine and Metabolites (TMS Derivatives) on Rxi®-5Sil MS (100 ng/mL)

Peaks	m/z 1	m/z 2	m/z 3
1. Ecgonine methyl ester	82	96	256
2. Ecgonine	82	96	356
3. Cocaine	82	182	303
4. Cocaethylene	82	196	317
5. Benzoylecgonine	82	96	346
6. Cannabinol*	409	--	--



GC_CF1149

Rxi® Technology!
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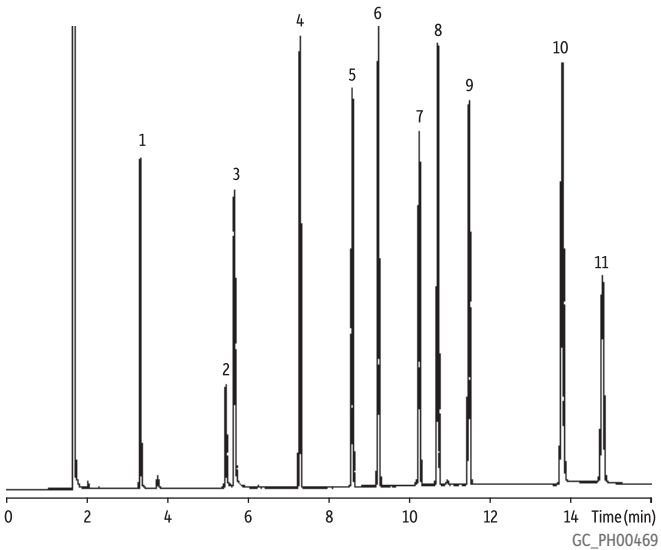
Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	
Diluent:	Butyl chloride
Conc.:	100 ng/mL
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Single taper w/wool (cat.# 22286-200.1)
Inj. Temp.:	250 °C
Purge Flow:	20 mL/min
Oven	
Oven Temp:	100 °C to 200 °C at 30 °C/min to 300 °C at 15 °C/min
Carrier Gas	He, constant linear velocity
Linear Velocity:	40 cm/sec, 12.5 psi, 86.2 kPa @ 100 °C
Detector	MS
Mode:	SIM
Transfer Line Temp.:	310 °C
Source Temp.:	250 °C
Solvent Delay Time:	4 min
Tune Type:	PFTBA
Ionization Mode:	EI
Instrument	Shimadzu 2010 GC & QP2010+ MS
Notes	Samples were prepared as follows: Standards brought to dryness under nitrogen, then 50 µL BSTFA + 1% TMCS (cat.# 35606) were added. 50 µL pyridine was then added, and samples were incubated at 70 °C for 30 min. After incubation, samples were diluted with butyl chloride.

* Cannabinol was used as a derivatization check.

Underivatized Cold Medications (Basic Drugs) on Rtx®-5 Amine

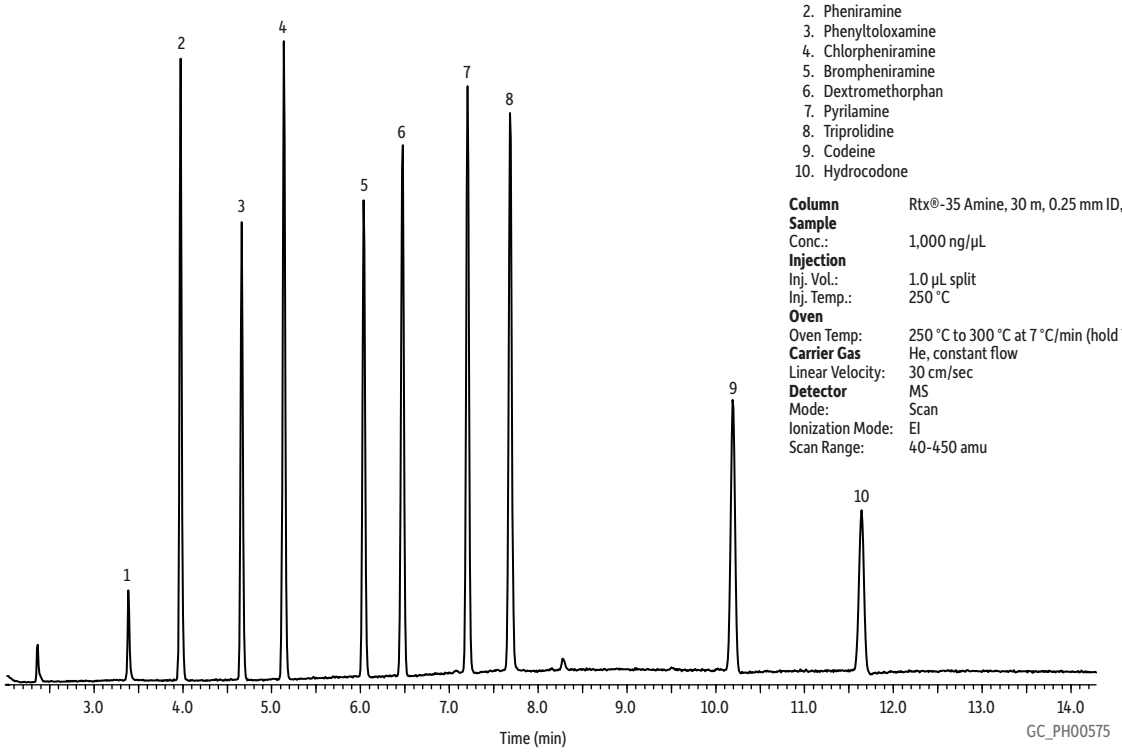


GC_PH00469

Peaks
1. Phenylpropanolamine
2. Phenylephrine
3. Guaifenesin
4. Pheniramine
5. Phenyltoloxamine
6. Chlorpheniramine
7. Brompheniramine
8. Dextromethorphan
9. Pyrilamine
10. Codeine
11. Hydrocodone

Column	Rtx®-5 Amine, 30 m, 0.53 mm ID, 1.00 µm (cat.# 12355)
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Inj. Temp.:	250 °C
Split Vent Flow Rate:	88 mL/min
Oven	
Oven Temp:	175 °C to 280 °C at 10 °C/min (hold 5.5 min)
Carrier Gas	He, constant flow
Linear Velocity:	40 cm/sec
Detector	FID @ 280 °C

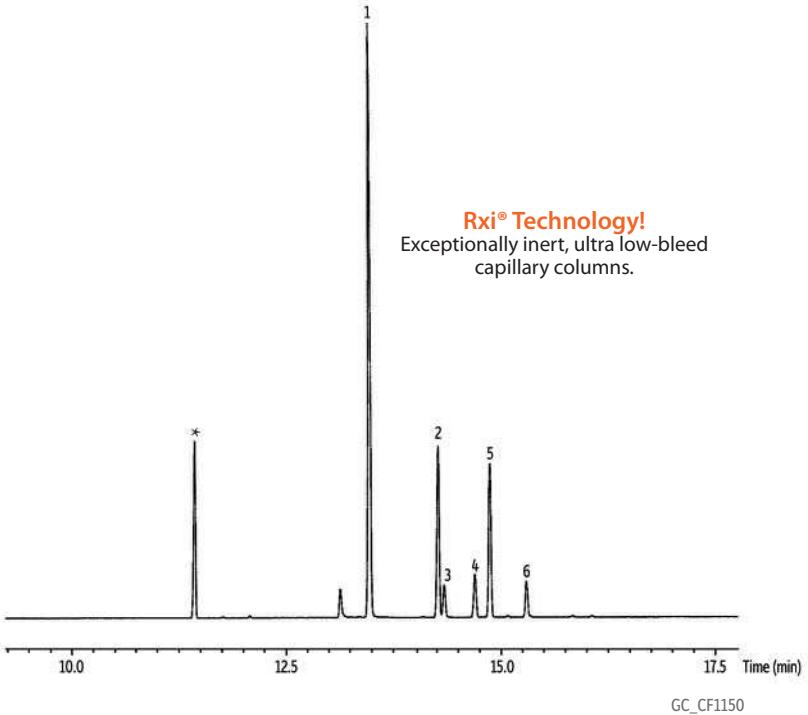
Underivatized Cold Medications (Basic Drugs) on Rtx®-35 Amine



Peaks
1. Guaifenesin
2. Pheniramine
3. Phenyltoloxamine
4. Chlorpheniramine
5. Brompheniramine
6. Dextromethorphan
7. Pyrilamine
8. Triprolidine
9. Codeine
10. Hydrocodone

Column	Rtx®-35 Amine, 30 m, 0.25 mm ID, 0.50 µm (cat.# 11338)
Sample	
Conc.:	1,000 ng/µL
Injection	
Inj. Vol.:	1.0 µL split
Inj. Temp.:	250 °C
Oven	
Oven Temp:	250 °C to 300 °C at 7 °C/min (hold 7 min)
Carrier Gas	He, constant flow
Linear Velocity:	30 cm/sec
Detector	MS
Mode:	Scan
Ionization Mode:	EI
Scan Range:	40-450 amu

Extracted Opiates from Blood on Rxi®-5Sil MS



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Exceptionally inert, ultra low-bleed capillary columns.

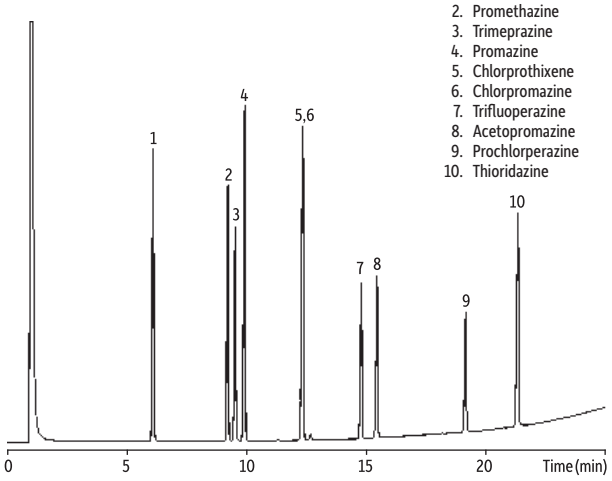
Peaks
1. Hydrocodone
2. Codeine
3. Oxycodone
4. Hydromorphone
5. 6-Monoacetylmorphine
6. Morphine

* Matrix

Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	
Diluent:	Ethyl acetate
Conc.:	100 ng/mL propionic anhydride derivatives
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Purge Flow:	100 mL/min
Oven	
Oven Temp:	65 °C (hold 1 min) to 315 °C at 15 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Linear Velocity:	35 cm/sec @ 65 °C
Detector	MS
Mode:	SIM
Transfer Line Temp.:	250 °C
Analyzer Type:	Quadrupole
Solvent Delay Time:	7 min
Tune Type:	PFTBA
Ionization Mode:	EI
Notes	Opiates were spiked into a blood sample and extracted by SPE, then derivatized with propionic anhydride.
Acknowledgement	Data courtesy of Miami Dade County Medical Examiner Department

Underivatized Phenothiazines (Basic Drugs) on Rtx®-5

Separation optimized using Pro *ez*GC!

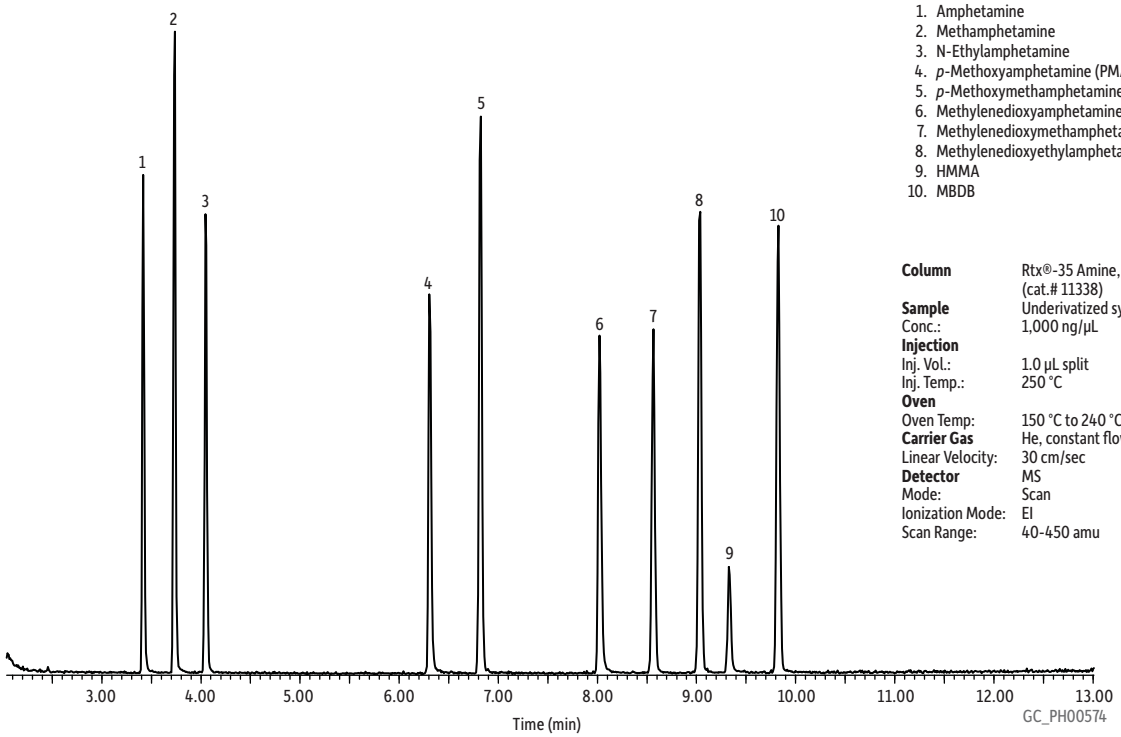


Peaks
1. Phenothiazine
2. Promethazine
3. Trimeprazine
4. Promazine
5. Chlorprothixene
6. Chlorpromazine
7. Trifluoperazine
8. Acetopromazine
9. Prochlorperazine
10. Thioridazine

GC_PH00269

Column	Rtx®-5, 15 m, 0.32 mm ID, 0.50 µm (cat.# 10236)
Sample	
Conc.:	2,000 ng/µL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 30:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	200 °C to 325 °C at 5 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	25 cm/sec @ 200 °C
Detector	FID @ 315 °C
Notes	FID sensitivity: 2.56 x 10^{-10} AFS

Underivatized Sympathomimetic Amines (Basic Drugs) on Rtx®-35 Amine



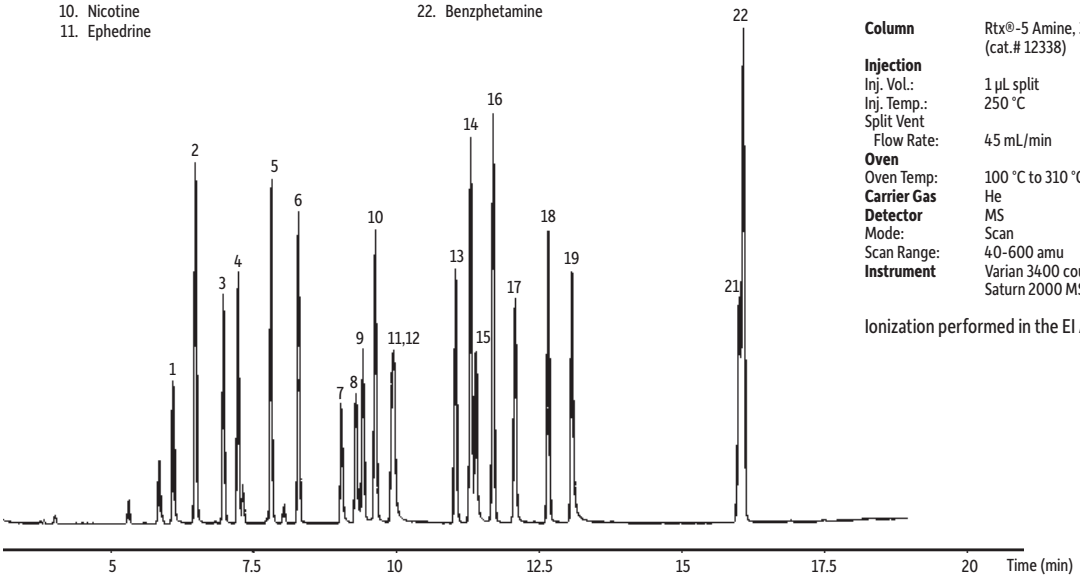
Peaks
1. Amphetamine
2. Methamphetamine
3. N-Ethylamphetamine
4. *p*-Methoxyamphetamine (PMA)
5. *p*-Methoxymethamphetamine (PMMA)
6. Methylenedioxyamphetamine (MDA)
7. Methylenedioxymethamphetamine (MDMA)
8. Methylenedioxyethylamphetamine (MDEA)
9. HMMA
10. MBDB

GC_PH00574

Column	Rtx®-35 Amine, 30 m, 0.25 mm ID, 0.50 µm (cat.# 11338)
Sample	Underivatized sympathomimetic amines
Conc.:	1,000 ng/µL
Injection	
Inj. Vol.:	1.0 µL split
Inj. Temp.:	250 °C
Oven	
Oven Temp:	150 °C to 240 °C at 7 °C/min
Carrier Gas	He, constant flow
Linear Velocity:	30 cm/sec
Detector	MS
Mode:	Scan
Ionization Mode:	EI
Scan Range:	40-450 amu

Underivatized Sympathomimetic Amines (Basic Drugs) on Rtx®-5 Amine

Peaks
1. Phenylethylamine
2. Amphetamine
3. Phentermine
4. Methamphetamine
5. Fenfluramine
6. Mephentermine
7. Cathinone
8. Phenylpropanolamine
9. Methcathinone
10. Nicotine
11. Ephedrine
12. Pseudoephedrine
13. Phenmetrazine
14. Phendimetrazine
15. Methylenedioxyamphetamine
16. Diethylpropion
17. Methylenedioxymethamphetamine
18. Methylenedioxyethylamphetamine
19. 4-Methyl-2,5-dimethoxyamphetamine
20. Phenylephrine
21. Caffeine
22. Benzphetamine



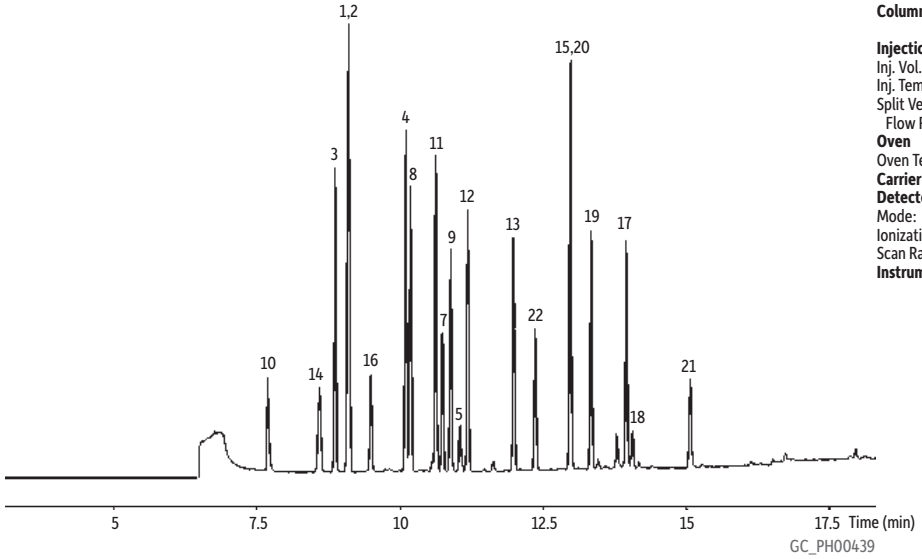
GC_PH00438

Column	Rtx®-5 Amine, 30 m, 0.25 mm ID, 0.50 µm (cat.# 12338)
Injection	
Inj. Vol.:	1 µL split
Inj. Temp.:	250 °C
Split Vent Flow Rate:	45 mL/min
Oven	
Oven Temp:	100 °C to 310 °C at 10 °C/min
Carrier Gas	He
Detector	MS
Mode:	Scan
Scan Range:	40-600 amu
Instrument	Varian 3400 coupled with with Varian Saturn 2000 MS detector

Ionization performed in the EI Auto mode.

Sympathomimetic Amines (Basic Drugs) (HFBA Derivatives) on Rtx®-200

Peaks
1. Phenylethylamine - HFBA
2. Amphetamine - HFBA
3. Phentermine - HFBA
4. Methamphetamine - HFBA
5. Fenfluramine - HFBA
6. Mephentermine - HFBA
7. Cathinone - HFBA
8. Phenylpropanolamine - HFBA
9. Methcathinone - HFBA
10. Nicotine - HFBA
11. Ephedrine - HFBA
12. Pseudoephedrine - HFBA
13. Phenmetrazine - HFBA
14. Phendimetrazine - HFBA
15. Methylenedioxyamphetamine - HFBA
16. Diethylpropion - HFBA
17. Methylene dioxymethamphetamine - HFBA
18. Methylene dioxyethylamphetamine - HFBA
19. 4-Methyl-2,5-dimethoxyamphetamine - HFBA
20. Phenylephrine - HFBA
21. Caffeine - HFBA
22. Benzphetamine - HFBA



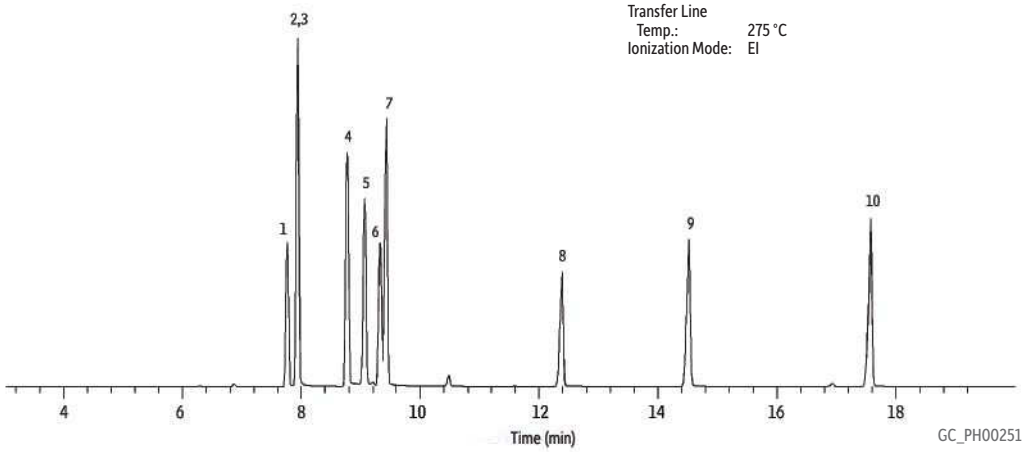
GC_PH00439

Column	Rtx®-200, 30 m, 0.25 mm ID, 0.50 µm (cat.# 15038)
Injection	
Inj. Vol.:	1 µL split
Inj. Temp.:	250 °C
Split Vent Flow Rate:	45 mL/min
Oven	
Oven Temp:	100 °C to 310 °C at 10 °C/min
Carrier Gas	He
Detector	MS
Mode:	Scan
Ionization Mode:	EI
Scan Range:	40-600 amu
Instrument	Varian 3400 coupled with with Varian Saturn 2000 MS detector

Sympathomimetic Amines (TFAA Derivatives) (Basic Drugs) on Rtx®-5

Peaks
1. Amphetamine - TFAA
2. Phentermine - TFAA
3. Phenylpropanolamine - TFAA
4. Ephedrine - TFAA
5. Methamphetamine - TFAA
6. Fenfluramine - TFAA
7. Pseudoephedrine - TFAA
8. Methylenedioxyamphetamine - TFAA
9. Methylenedioxymethamphetamine - TFAA
10. Methylphenidate - TFAA

Column	Rtx®-5, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10223)
Sample	Derivatized sympathomimetic amines
Conc.:	Approximately 2.5 ng/µL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 1.0 min)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	40 °C (hold 1 min) to 150 °C at 30 °C/min to 300 °C at 5 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	20 cm/sec @ 100 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	275 °C
Ionization Mode:	EI

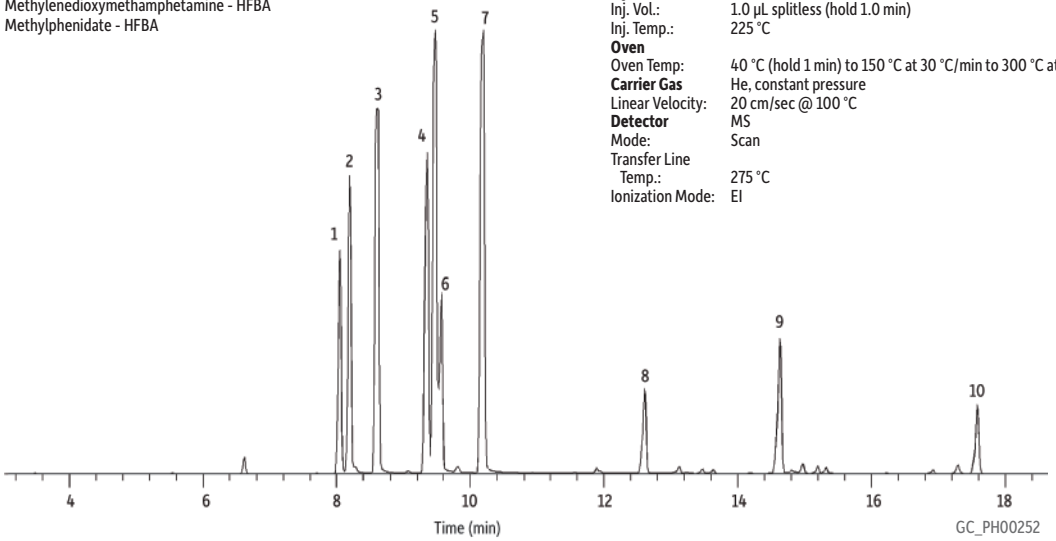


GC_PH00251

Sympathomimetic Amines (HFBA Derivatives) (Basic Drugs) on Rtx®-5

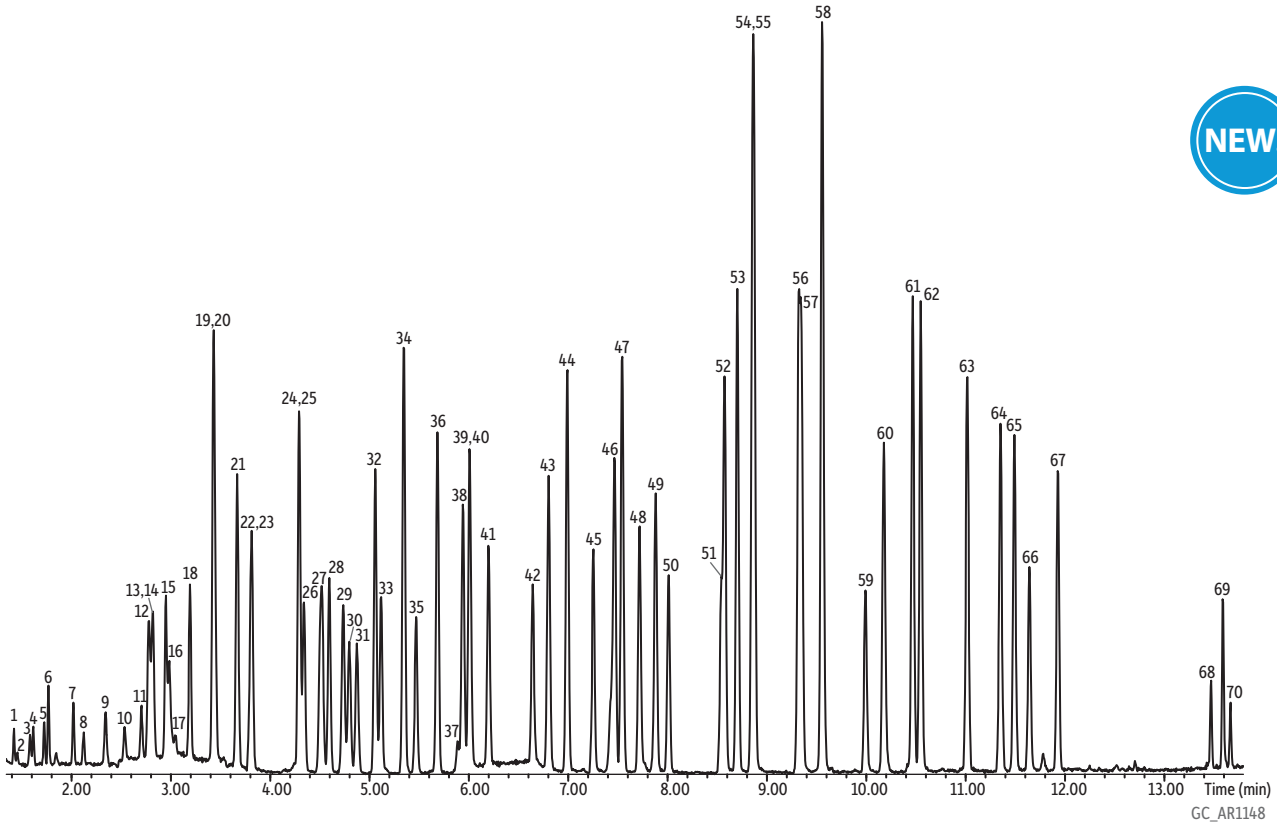
Peaks
1. Amphetamine - HFBA
2. Phentermine - HFBA
3. Phenylpropanolamine - HFBA
4. Ephedrine - HFBA
5. Methamphetamine - HFBA
6. Fenfluramine - HFBA
7. Pseudoephedrine - HFBA
8. Methylenedioxyamphetamine - HFBA
9. Methylenedioxymethamphetamine - HFBA
10. Methylphenidate - HFBA

Column	Rtx®-5, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10223)
Sample	Derivatized sympathomimetic amines
Conc.:	Approximately 2.5 ng/µL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 1.0 min)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	40 °C (hold 1 min) to 150 °C at 30 °C/min to 300 °C at 5 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	20 cm/sec @ 100 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	275 °C
Ionization Mode:	EI



GC_PH00252

TO-15 65 Component Mix on Rxi®-624Sil MS (30 m)



GC_AR1148

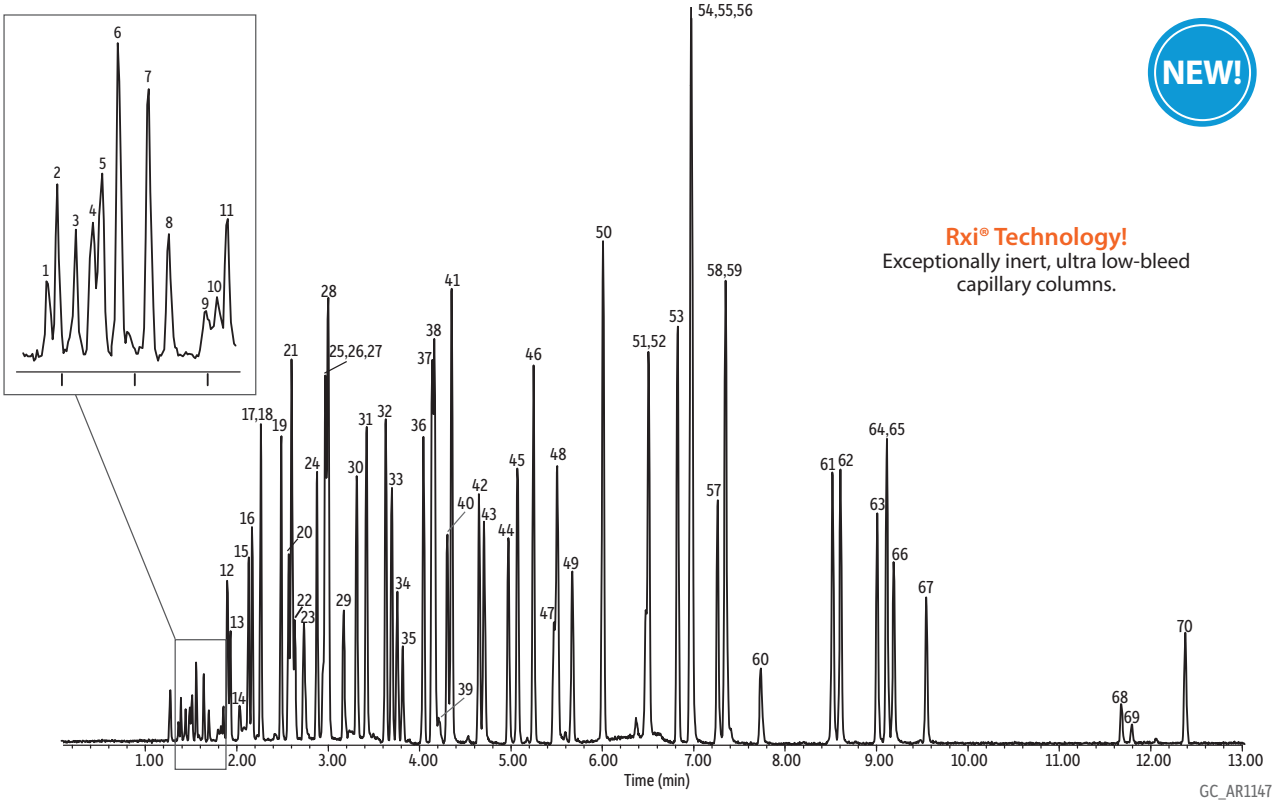
Column	Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870)
Sample	TO-15 65 component mix (cat.# 34436) TO-14A internal standard/ tuning mix (cat.# 34408)
Diluent:	Nitrogen
Conc.:	10.0 ppbv 200 cc injection
Injection	Direct
Oven	
Oven Temp.:	32 °C (hold 1 min) to 150 °C at 11 °C/min to 230 °C at 33 °C/min
Carrier Gas	He, constant flow
Flow Rate:	2.0 mL/min
Linear Velocity:	51 cm/sec @ 32 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	230 °C
Analyzer Type:	Quadrupole
Source Temp.:	230 °C
Quad Temp.:	150 °C
Electron Energy:	69.9 eV
Solvent Delay Time:	1.0 min
Tune Type:	BFB
Ionization Mode:	EI
Scan Range:	35 - 250 amu
Scan Rate:	3.32 scans/sec
Preconcentrator	Nutech 8900DS
Trap 1 Settings	
Type/Sorbent :	Glass Beads
Cooling temp:	-155 °C
Preheat temp:	5 °C
Preheat time:	0 sec
Desorb temp:	20 °C
Desorb flow:	5 mL/min
Desorb time:	360 sec
Bakeout temp:	200 °C
Flush flow:	120 mL/min
Flush time:	60 sec
Sweep flow:	120 mL/min
Sweep time:	60 sec
Trap 2 Settings	
Type/Sorbent:	Tenax®
Cooling temp:	-35 °C
Desorb temp:	190 °C
Desorb time:	30 sec
Bakeout temp:	200 °C
Bakeout time:	10 sec
Cryofocuser	
Cooling temp:	-160 °C
Inject time:	140 sec
Internal Standard	
Purge flow:	100 mL/min
Purge time:	6 sec
Vol.:	20 mL
ISTD flow:	100 mL/min
Standard	
Size:	200 mL
Purge flow:	100 mL/min
Purge time:	6 sec
Sample flow:	100 mL/min
Instrument	HP6890 GC & 5973 MSD
Acknowledgement	Nutech

	Peaks	t_R (min)
1.	Propylene	1.42
2.	Dichlorodifluoromethane (Freon® 12)	1.46
3.	1,2-Dichlorotetrafluoroethane (Freon® 114)	1.58
4.	Chloromethane	1.62
5.	Vinyl chloride	1.73
6.	1,3-Butadiene	1.77
7.	Bromomethane	2.02
8.	Chloroethane	2.12
9.	Trichlorofluoromethane (Freon® 11)	2.34
10.	Ethanol	2.54
11.	Acrolein	2.71
12.	1,1-Dichloroethene	2.78
13.	1,1,2-Trichlorotrifluoroethane (Freon® 113)	2.80
14.	Acetone	2.82
15.	Carbon disulfide	2.95
16.	Isopropyl alcohol	2.99
17.	Acetonitrile (contaminant)	3.05
18.	Methylene chloride	3.20
19.	*trans*-1,2-Dichloroethene	3.43
20.	Methyl *tert*-butyl ether (MTBE)	3.44
21.	Hexane	3.67
22.	1,1-Dichloroethane	3.80
23.	Vinyl acetate	3.82
24.	2-Butanone (MEK)	4.29
25.	*cis*-1,2-Dichloroethene	4.29
26.	Ethyl acetate	4.34
27.	Bromochloromethane (IS)	4.50
28.	Tetrahydrofuran	4.52
29.	Chloroform	4.60
30.	1,1,1-Trichloroethane	4.74
31.	Cyclohexane	4.80
32.	Carbon tetrachloride	4.88
33.	Benzene	5.06
34.	1,2-Dichloroethane	5.12
35.	Heptane	5.35

	Peaks	t_R (min)
36.	1,4-Difluorobenzene (IS)	5.47
37.	Trichloroethylene	5.69
38.	1,2-Dichloropropane	5.94
39.	Methyl methacrylate	6.01
40.	1,4-Dioxane	6.02
41.	Bromodichloromethane	6.20
42.	*cis*-1,3-Dichloropropene	6.64
43.	4-Methyl-2-pentanone (MIBK)	6.80
44.	Toluene	6.99
45.	*trans*-1,3-Dichloropropene	7.26
46.	1,1,2-Trichloroethane	7.47
47.	Tetrachloroethene	7.55
48.	2-Hexanone (MBK)	7.72
49.	Dibromochloromethane	7.88
50.	1,2-Dibromoethane	8.01
51.	Chlorobenzene-d5 (IS)	8.54
52.	Chlorobenzene	8.58
53.	Ethylbenzene	8.71
54.	*m*-Xylene	8.87
55.	*p*-Xylene	8.87
56.	*o*-Xylene	9.32
57.	Styrene	9.35
58.	Bromoform	9.56
59.	4-Bromofluorobenzene*	9.99
60.	1,1,2,2-Tetrachloroethane	10.18
61.	4-Ethyltoluene	10.47
62.	1,3,5-Trimethylbenzene	10.55
63.	1,2,4-Trimethylbenzene	11.02
64.	1,3-Dichlorobenzene	11.35
65.	1,4-Dichlorobenzene	11.49
66.	Benzyl chloride	11.65
67.	1,2-Dichlorobenzene	11.93
68.	1,2,4-Trichlorobenzene	13.47
69.	Hexachlorobutadiene	13.59
70.	Naphthalene	13.67

*Tuning standard

TO-15 65 Component Mix on Rxi®-1ms (30 m)



Column	Rxi®-1ms, 30 m, 0.32 mm ID, 1.00 µm (cat.# 13354)
Sample	TO-15 65 component mix (cat.# 34436) TO-14A internal standard/ tuning mix (cat.# 34408)
Diluent:	Nitrogen
Conc.:	10.0 ppbv 250 cc injection
Injection	Direct
Oven	
Oven Temp:	35 °C (hold 1 min) to 230 °C at 11 °C/min
Carrier Gas	He, constant flow
Flow Rate:	2.0 mL/min
Linear Velocity:	51 cm/sec @ 35 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	230 °C
Analyzer Type:	Quadrupole
Source Temp.:	230 °C
Quad Temp.:	150 °C
Electron Energy:	69.9 eV
Solvent Delay Time:	1.0 min
Tune Type:	BFB
Ionization Mode:	EI
Scan Range:	35 - 250 amu
Scan Rate:	3.32 scans/sec
Preconcentrator	Nutech 8900DS
Trap 1 Settings	
Type/Sorbent :	Glass Beads
Cooling temp:	-155 °C
Preheat temp:	5 °C
Preheat time:	0 sec
Desorb temp:	20 °C
Desorb flow:	5 mL/min
Desorb time:	360 sec
Bakeout temp:	200 °C
Flush flow:	120 mL/min
Flush time:	60 sec
Sweep flow:	120 mL/min
Sweep time:	60 sec

Trap 2 Settings	
Type/Sorbent:	Tenax®
Cooling temp:	-35 °C
Desorb temp:	190 °C
Desorb time:	30 sec
Bakeout temp:	200 °C
Bakeout time:	10 sec
Cryofocuser	
Cooling temp:	-160 °C
Inject time:	140 sec
Internal Standard	
Purge flow:	100 mL/min
Purge time:	6 sec
Vol.:	20 mL
ISTD flow:	100 mL/min
Standard	
Size:	200 mL
Purge flow:	100 mL/min
Purge time:	6 sec
Sample flow:	100 mL/min
Instrument	HP6890 GC & 5973 MSD
Acknowledgement	Nutech Instruments

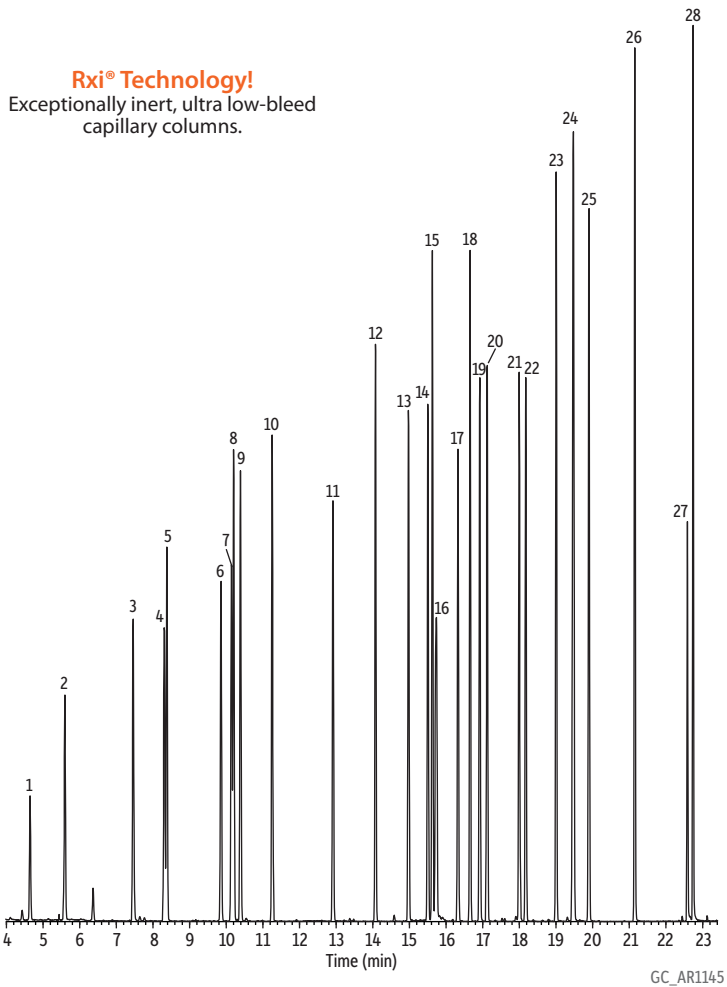
	Peaks	tR (min)
1.	Propylene	1.37
2.	Dichlorodifluoromethane (Freon® 12)	1.39
3.	Chloromethane	1.44
4.	1,2-Dichlorotetrafluoroethane (Freon® 114)	1.49
5.	Vinyl chloride	1.51
6.	1,3-Butadiene	1.56
7.	Bromomethane	1.64
8.	Chloroethane	1.70
9.	Ethanol	1.80
10.	Acetonitrile (contaminant)	1.83
11.	Acrolein	1.86
12.	Acetone	1.90
13.	Trichlorofluoromethane (Freon® 11)	1.93
14.	Isopropyl alcohol	2.03
15.	1,1-Dichloroethene	2.13
16.	Methylene chloride	2.17
17.	Carbon disulfide	2.26
18.	1,1,2-Trichlorotrifluoroethane (Freon® 113)	2.27
19.	*trans*-1,2-Dichloroethene	2.49
20.	1,1-Dichloroethane	2.57
21.	Methyl *tert*-butyl ether (MTBE)	2.60
22.	Vinyl acetate	2.64
23.	2-Butanone (MEK)	2.74
24.	*cis*-1,2-Dichloroethene	2.88
25.	Bromochloromethane (IS)	2.94
26.	Hexane*	2.97
27.	Ethyl acetate*	2.99
28.	Chloroform	3.00
29.	Tetrahydrofuran	3.17
30.	1,2-Dichloroethane	3.32
31.	1,1,1-Trichloroethane	3.42
32.	Benzene	3.63
33.	Carbon tetrachloride	3.70
34.	Cyclohexane	3.76

	Peaks	tR (min)
35.	1,4-Difluorobenzene (IS)	3.82
36.	1,2-Dichloropropane	4.05
37.	Bromodichloromethane	4.14
38.	Trichloroethylene	4.17
39.	1,4-Dioxane	4.21
40.	Methyl methacrylate	4.31
41.	Heptane	4.35
42.	*cis*-1,3-Dichloropropene	4.65
43.	4-Methyl-2-pentanone (MIBK)	4.71
44.	*trans*-1,3-Dichloropropene	4.98
45.	1,1,2-Trichloroethane	5.07
46.	Toluene	5.25
47.	2-Hexanone (MBK)	5.47
48.	Dibromochloromethane	5.51
49.	1,2-Dibromoethane	5.67
50.	Tetrachloroethene	6.01
51.	Chlorobenzene-d5 (IS)	6.48
52.	Chlorobenzene	6.51
53.	Ethylbenzene	6.83
54.	*m*-Xylene	6.98
55.	*p*-Xylene	6.98
56.	Bromoform	6.98
57.	Styrene	7.26
58.	1,1,2,2-Tetrachloroethane	7.35
59.	*o*-Xylene	7.35
60.	4-Bromofluorobenzene**	7.74
61.	4-Ethyltoluene	8.52
62.	1,3,5-Trimethylbenzene	8.61
63.	1,2,4-Trimethylbenzene	9.01
64.	Benzyl chloride	9.11
65.	1,3-Dichlorobenzene	9.11
66.	1,4-Dichlorobenzene	9.19
67.	1,2-Dichlorobenzene	9.55
68.	1,2,4-Trichlorobenzene	11.68
69.	Naphthalene	11.79
70.	Hexachlorobutadiene	12.38

*Peaks 26 and 27 share ion m/z 43;
**Tuning standard

Mass APH on Rxi®-1ms

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.



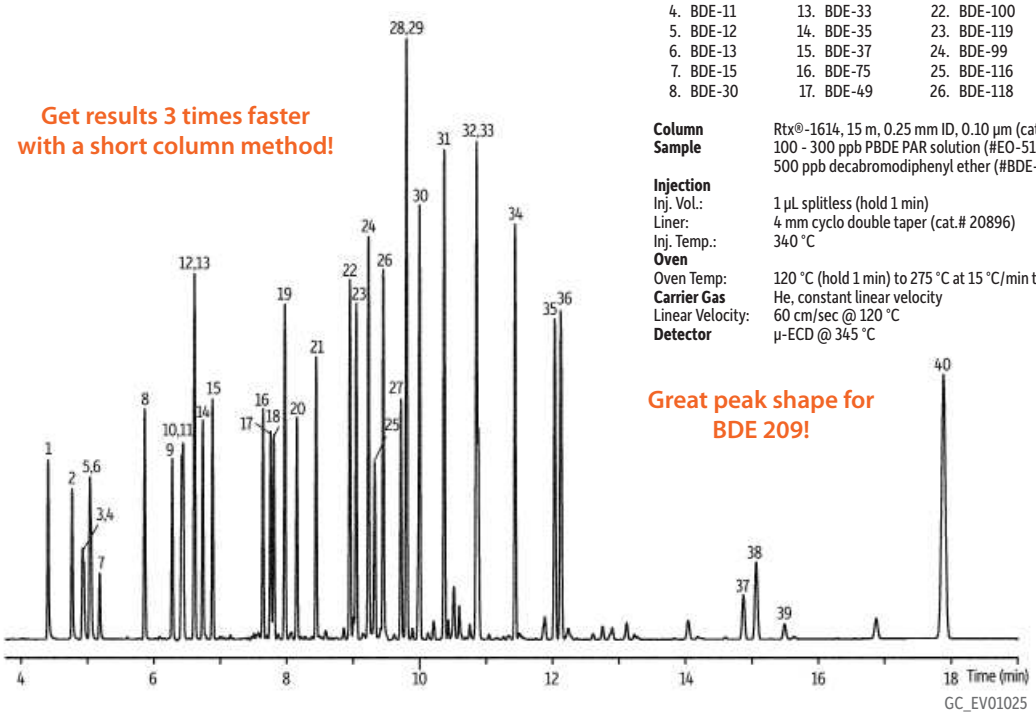
GC_AR1145

Peaks
1. 1,3-Butadiene
2. iso-Pentane
3. Methyl *tert*-butyl ether
4. Bromochloromethane
5. *n*-Hexane
6. Benzene
7. Cyclohexane
8. 1,4-Difluorobenzene
9. 2,3-Dimethylpentane
10. *n*-Heptane
11. Toluene
12. *n*-Octane
13. Chlorobenzene-d5
14. Ethylbenzene
15. 2,3-Dimethylheptane
16. *m*-Xylene/*p*-Xylene
17. *o*-Xylene
18. *n*-Nonane
19. 4-Bromofluorobenzene
20. Isopropylbenzene
21. 1-Ethyl-3-methylbenzene
22. 1,3,5-Trimethylbenzene
23. *n*-Decane
24. 1,2,3-Trimethylbenzene/*p*-Isopropyltoluene
25. Butylcyclohexane
26. *n*-Undecane
27. Naphthalene
28. *n*-Dodecane

Column	Rxi®-1ms, 60 m, 0.32 mm ID, 1.00 µm (cat.# 13357)
Injection	Splitless
Oven	
Oven Temp:	35 °C (hold 5 min) to 220 °C at 7 °C/min (hold 2 min)
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	240 °C
Analyzer Type:	Quadrupole
Source Temp.:	230 °C
Quad Temp.:	150 °C
Solvent Delay Time:	4.0 min
Ionization Mode:	EI
Scan Range:	35-250 amu
Preconcentrator	Entech 7100
Instrument	HP6890 GC & 5973 MSD
Acknowledgement	Courtesy of Mass DEP, Northeast Region

Brominated Flame Retardants on Rtx®-1614

Get results 3 times faster with a short column method!



GC_EV01025

Peaks				
1. BDE-10	9. BDE-32	18. BDE-71	27. BDE-85	36. BDE-190
2. BDE-7	10. BDE-17	19. BDE-47	28. BDE-155	37. BDE-208
3. BDE-8	11. BDE-25	20. BDE-66	29. BDE-126	38. BDE-207
4. BDE-11	12. BDE-28	21. BDE-77	30. BDE-154	39. BDE-206
5. BDE-12	13. BDE-33	22. BDE-100	31. BDE-153	40. BDE-209
6. BDE-13	14. BDE-35	23. BDE-119	32. BDE-138	
7. BDE-15	15. BDE-37	24. BDE-99	33. BDE-166	
8. BDE-30	16. BDE-75	25. BDE-116	34. BDE-183	
	17. BDE-49	26. BDE-118	35. BDE-181	

Column	Rtx®-1614, 15 m, 0.25 mm ID, 0.10 µm (cat.# 10296)
Sample	100 - 300 ppb PBDE PAR solution (#EO-5113, Cambridge Isotope Laboratories Inc.) 500 ppb decabromodiphenyl ether (#BDE-209, Wellington Laboratories)
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	4 mm cyclo double taper (cat.# 20896)
Inj. Temp.:	340 °C
Oven	
Oven Temp:	120 °C (hold 1 min) to 275 °C at 15 °C/min to 300 °C at 5 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	60 cm/sec @ 120 °C
Detector	µ-ECD @ 345 °C

Great peak shape for BDE 209!

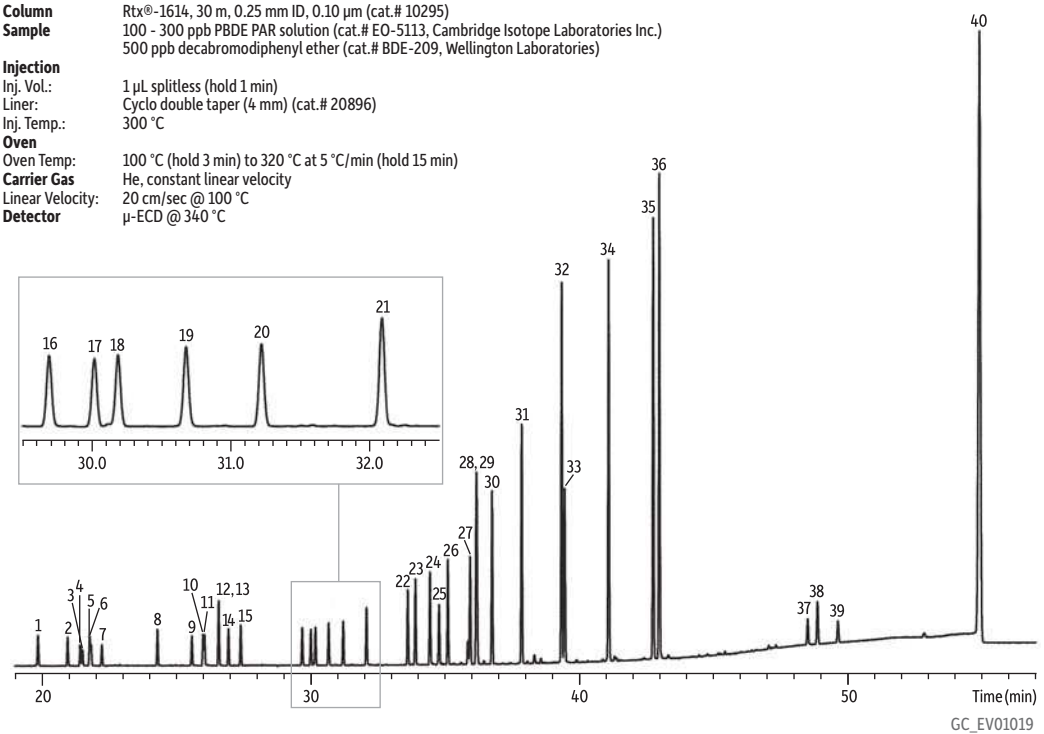
also see:

PCBs and Brominated Flame Retardants

pages **603–604**

Brominated Flame Retardants on Rtx®-1614

Column	Rtx®-1614, 30 m, 0.25 mm ID, 0.10 µm (cat.# 10295)
Sample	100 - 300 ppb PBDE PAR solution (cat.# EO-5113, Cambridge Isotope Laboratories Inc.) 500 ppb decabromodiphenyl ether (cat.# BDE-209, Wellington Laboratories)
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20896)
Inj. Temp.:	300 °C
Oven	
Oven Temp:	100 °C (hold 3 min) to 320 °C at 5 °C/min (hold 15 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	20 cm/sec @ 100 °C
Detector	µ-ECD @ 340 °C

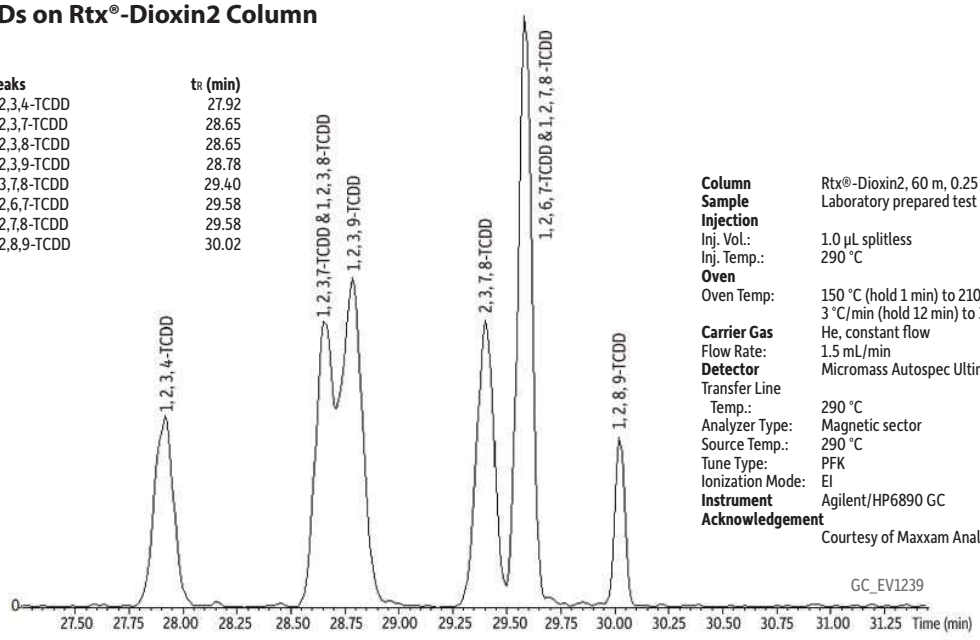


GC_EV01019

Peaks	
1. BDE-10	21. BDE-77
2. BDE-7	22. BDE-100
3. BDE-8	23. BDE-119
4. BDE-11	24. BDE-99
5. BDE-12	25. BDE-116
6. BDE-13	26. BDE-118
7. BDE-15	27. BDE-85
8. BDE-30	28. BDE-155
9. BDE-32	29. BDE-126
10. BDE-17	30. BDE-154
11. BDE-25	31. BDE-153
12. BDE-28	32. BDE-138
13. BDE-33	33. BDE-166
14. BDE-35	34. BDE-183
15. BDE-37	35. BDE-181
16. BDE-75	36. BDE-190
17. BDE-49	37. BDE-208
18. BDE-71	38. BDE-207
19. BDE-47	39. BDE-206
20. BDE-66	40. BDE-209

TCDDs on Rtx®-Dioxin2 Column

Peaks	tR (min)
1. 1,2,3,4-TCDD	27.92
2. 1,2,3,7-TCDD	28.65
3. 1,2,3,8-TCDD	28.65
4. 1,2,3,9-TCDD	28.78
5. 2,3,7,8-TCDD	29.40
6. 1,2,6,7-TCDD	29.58
7. 1,2,7,8-TCDD	29.58
8. 1,2,8,9-TCDD	30.02

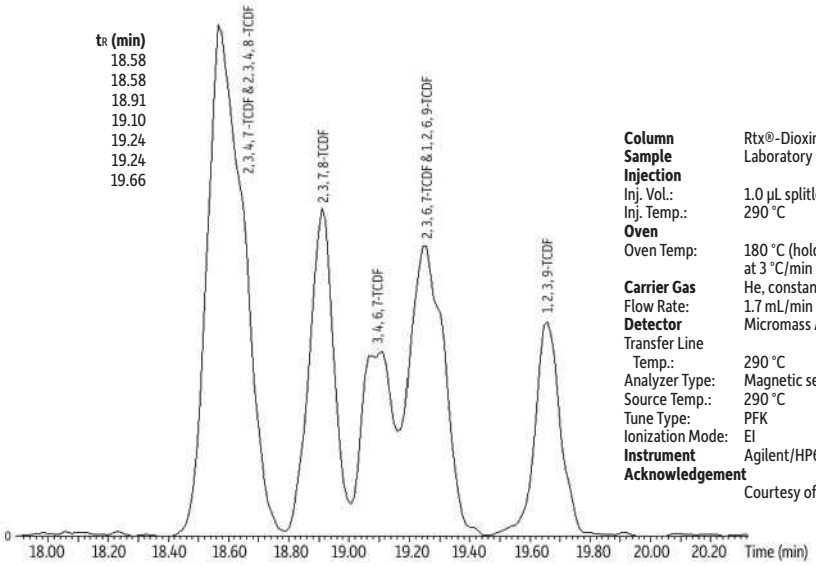


GC_EV1239

Column	Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)
Sample	Laboratory prepared test mix
Injection	
Inj. Vol.:	1.0 µL splitless
Inj. Temp.:	290 °C
Oven	
Oven Temp:	150 °C (hold 1 min) to 210 °C at 30 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 12 min) to 330 °C at 70 °C/min (hold 6 min)
Carrier Gas	He, constant flow
Flow Rate:	1.5 mL/min
Detector	Micromass Autospec Ultima
Transfer Line Temp.:	290 °C
Analyzer Type:	Magnetic sector
Source Temp.:	290 °C
Tune Type:	PFK
Ionization Mode:	EI
Instrument	Agilent/HP6890 GC
Acknowledgement	Courtesy of Maxxam Analytics (Ontario, Canada).

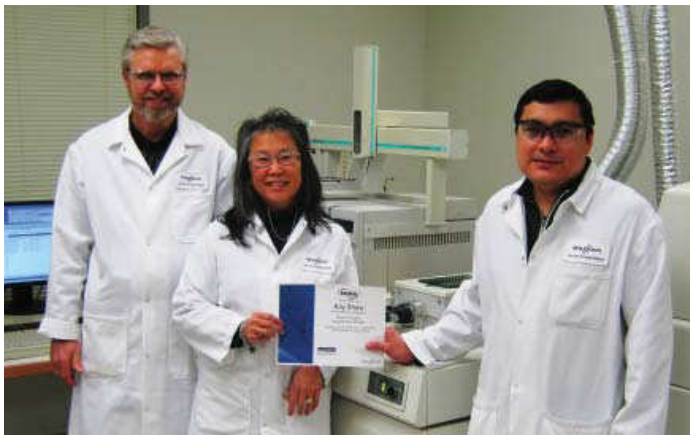
TCDFs on Rtx®-Dioxin2 Column

Peaks	tR (min)
1. 2,3,4,7-TCDF	18.58
2. 2,3,4,8-TCDF	18.58
3. 2,3,7,8-TCDF	18.91
4. 3,4,6,7-TCDF	19.10
5. 2,3,6,7-TCDF	19.24
6. 1,2,6,9-TCDF	19.24
7. 1,2,3,9-TCDF	19.66



GC_EV1252

Column	Rtx®-Dioxin2, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10758)
Sample	Laboratory prepared test mix
Injection	
Inj. Vol.:	1.0 µL splitless
Inj. Temp.:	290 °C
Oven	
Oven Temp:	180 °C (hold 1 min) to 235 °C at 45 °C/min (hold 1 min) to 250 °C at 3 °C/min (hold 15 min) to 300 °C at 50 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.7 mL/min
Detector	Micromass Autospec Ultima
Transfer Line Temp.:	290 °C
Analyzer Type:	Magnetic sector
Source Temp.:	290 °C
Tune Type:	PFK
Ionization Mode:	EI
Instrument	Agilent/HP6890 GC
Acknowledgement	Courtesy of Maxxam Analytics (Ontario, Canada).



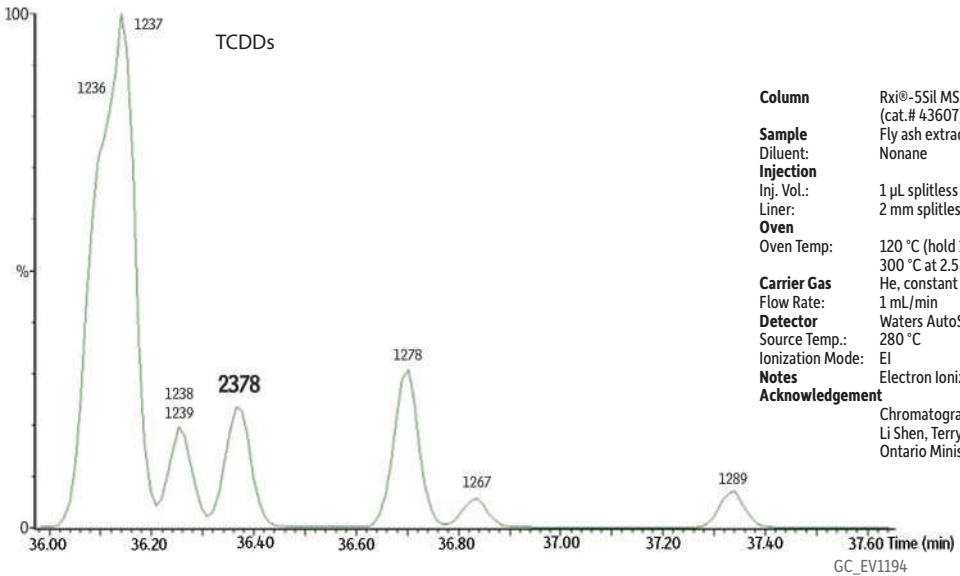
Maxxam Analytics HRMS Group Receives Kaizen Award for Productivity Improvements

Congratulations to Maxxam Analytics' Hi-Res Mass Spec Ultra Trace Analysis team, who received a Kaizen award for productivity improvements made using the Rtx®-Dioxin2 column. Shown from left to right are: Owen Cosby, Supervisor HRMS Services; Kay Shaw, HRMS Team Leader and Scientific Specialist; and Angel Guerrero, HRMS Senior Analyst.

According to Owen Cosby of Maxxam Analytics, "Using the Rtx®-Dioxin2 column allowed us to combine EPA 1613 TCDD-only and TCDF confirmation analyses onto one column and one instrument. This resulted in multiple benefits—we shortened run times, reduced instrument downtime and column changes, and increased instrument capacity for our full-list samples."

Dioxins (TCDDs) in Fly Ash on Rxi®-5Sil MS column

NEW!

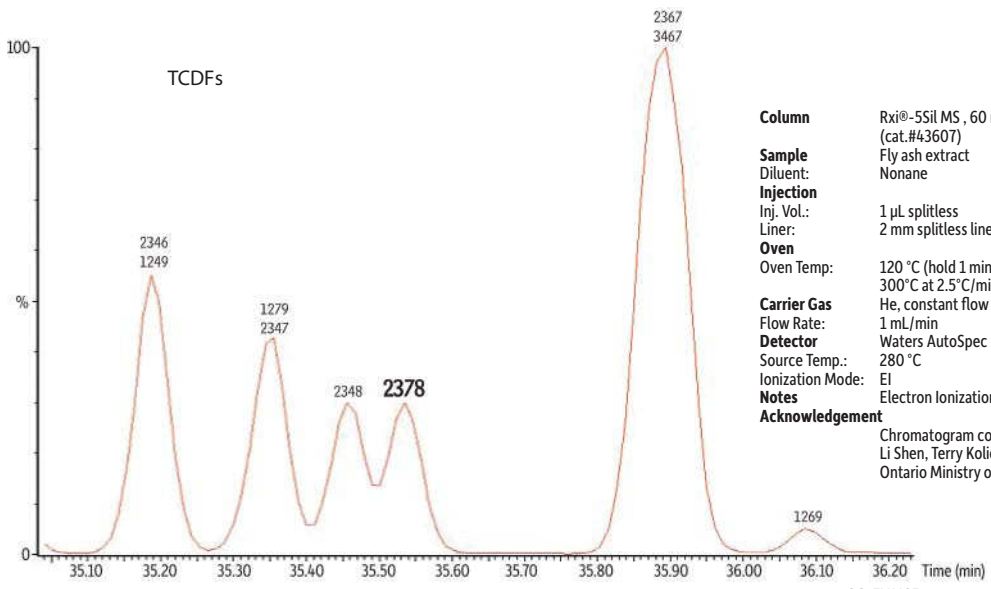


GC_EV1194

Column	Rxi®-5Sil MS , 60 m, 0.18 mm ID, 0.10 µm (cat.# 43607)
Sample	Fly ash extract
Diluent:	Nonane
Injection	
Inj. Vol.:	1 µL splitless
Liner:	2 mm splitless liner (cat.# 20712)
Oven	
Oven Temp:	120 °C (hold 1 min) to 160 °C at 10 °C/min to 300 °C at 2.5 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	Waters AutoSpec Ultima Mass Spectrometer
Source Temp.:	280 °C
Ionization Mode:	EI
Notes	Electron Ionization at 40eV
Acknowledgement	Chromatogram courtesy of Karen MacPherson, Li Shen, Terry Kolic, and Eric Reiner at the Ontario Ministry of the Environment

Furans (TCDFs) in Fly Ash on Rxi®-5Sil MS

NEW!

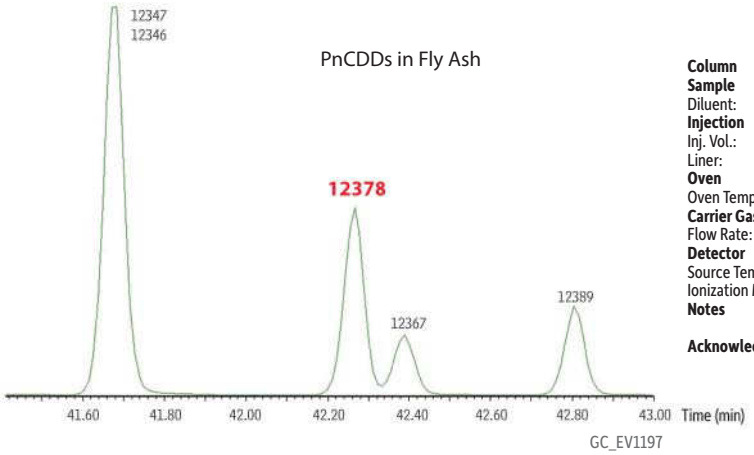


GC_EV1195

Column	Rxi®-5Sil MS , 60 m, 0.18 mm ID, 0.10 µm (cat.#43607)
Sample	Fly ash extract
Diluent:	Nonane
Injection	
Inj. Vol.:	1 µL splitless
Liner:	2 mm splitless liner (cat.# 20712)
Oven	
Oven Temp:	120 °C (hold 1 min) to 160 °C at 10 °C/min to 300°C at 2.5°C/min
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	Waters AutoSpec Ultima Mass Spectrometer
Source Temp.:	280 °C
Ionization Mode:	EI
Notes	Electron Ionization at 40eV
Acknowledgement	Chromatogram courtesy of Karen MacPherson, Li Shen, Terry Kolic, and Eric Reiner at the Ontario Ministry of the Environment

Dioxins (PnCDDs) in Fly Ash on Rxi®-5Sil MS

NEW!

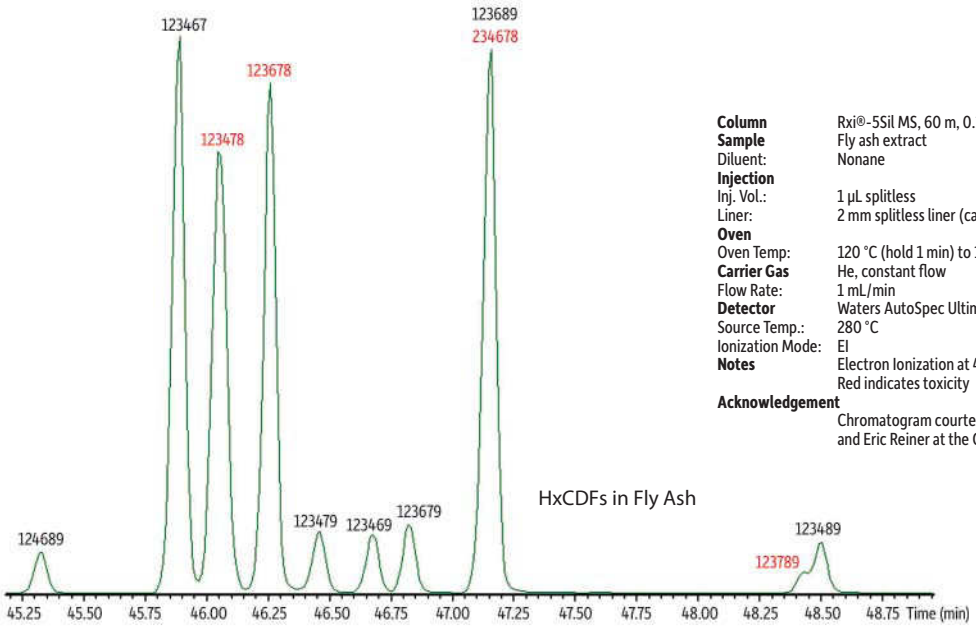


GC_EV1197

Column	Rxi®-5Sil MS, 60 m, 0.18 mm ID, 0.10 µm (cat.# 43607)
Sample	Fly ash extract
Diluent:	Nonane
Injection	
Inj. Vol.:	1 µL splitless
Liner:	2 mm splitless liner (cat.# 20712)
Oven	
Oven Temp:	120 °C (hold 1 min) to 160 °C at 10 °C/min to 300 °C at 2.5 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	Waters AutoSpec Ultima Mass Spectrometer
Source Temp.:	280 °C
Ionization Mode:	EI
Notes	Electron Ionization at 40eV
	Red indicates toxicity
Acknowledgement	
	Chromatogram courtesy of Karen MacPherson, Li Shen, Terry Kolic, and Eric Reiner at the Ontario Ministry of the Environment

Dioxins (HxCDFs) in Fly Ash on Rxi®-5Sil MS

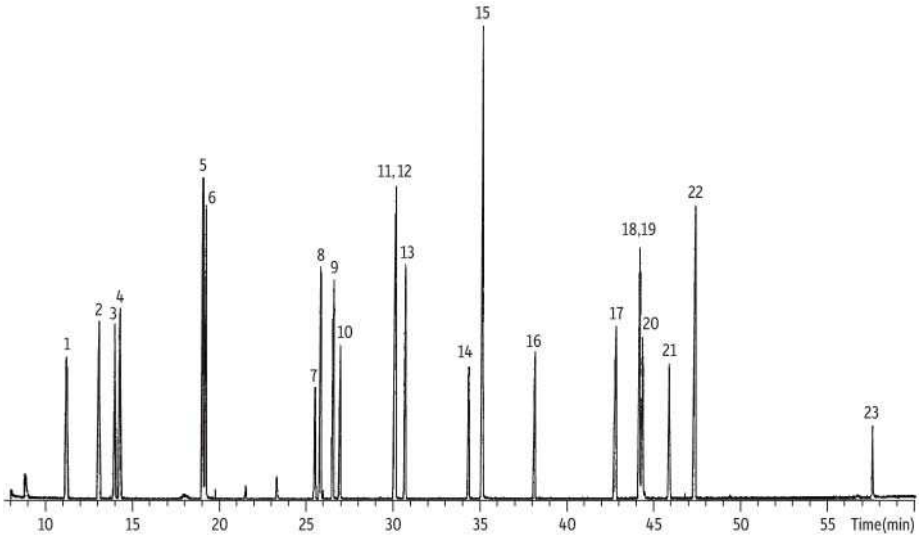
NEW!



GC_EV1199

Column	Rxi®-5Sil MS, 60 m, 0.18 mm ID, 0.10 µm (cat.# 43607)
Sample	Fly ash extract
Diluent:	Nonane
Injection	
Inj. Vol.:	1 µL splitless
Liner:	2 mm splitless liner (cat.# 20712)
Oven	
Oven Temp:	120 °C (hold 1 min) to 160 °C at 10 °C/min to 300 °C at 2.5 °C/min
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	Waters AutoSpec Ultima Mass Spectrometer
Source Temp.:	280 °C
Ionization Mode:	EI
Notes	Electron Ionization at 40eV
	Red indicates toxicity
Acknowledgement	
	Chromatogram courtesy of Karen MacPherson, Li Shen, Terry Kolic, and Eric Reiner at the Ontario Ministry of the Environment

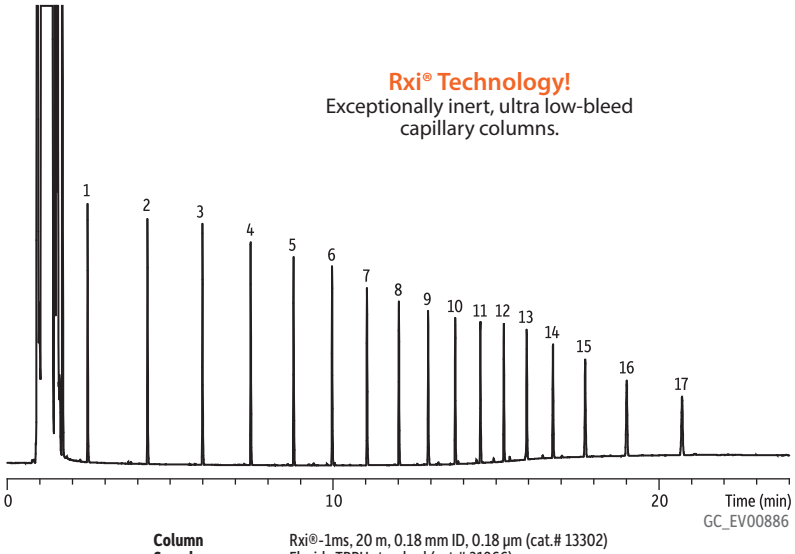
Explosives on Rtx®-200



Peaks
1. 2-Nitrotoluene
2. 3-Nitrotoluene
3. 4-Nitrotoluene
4. 2,3-Diaminotoluene
5. 2,6-Diaminotoluene
6. 2,4-Diaminotoluene
7. 1,4-Dinitrobenzene
8. 2,6-Dinitrotoluene
9. 2-Amino-6-nitrotoluene
10. 1,3-Dinitrobenzene
11. 2,4-Dinitrotoluene
12. 2-Amino-4-nitrotoluene
13. 2,3-Dinitrotoluene
14. 3,4-Dinitrotoluene
15. 3-Nitrobiphenyl
16. 2,4,6-Trinitrotoluene
17. 2,4,5-Trinitrotoluene
18. 4-Amino-2,6-dinitrotoluene
19. 2,3,4-Trinitrotoluene
20. 1,3-Dinitronaphthalene
21. 2,6-Diamino-4-nitrotoluene
22. 2-Amino-4,6-dinitrotoluene
23. 2,2'-Dinitrobiphenyl

Column	Rtx®-200, 30 m, 0.25 mm ID, 0.25 µm (cat.# 15023)
Sample	Explosives sample
Conc.:	20 ng/µL
Injection	
Inj. Vol.:	1 µL splitless (hold 0.6 min)
Inj. Temp.:	280 °C
Oven	
Oven Temp:	80 °C (hold 2 min) to 260 °C at 3 °C/min (hold 2 min)
Carrier Gas	He, constant pressure
Linear Velocity:	20 cm/sec @ 80 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	300 °C
Analyzer Type:	Quadrupole
Ionization Mode:	EI

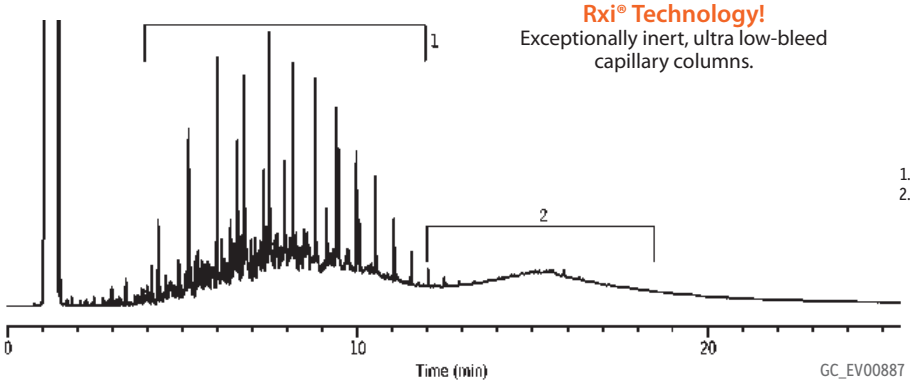
Petroleum Hydrocarbons (TPH) on Rxi®-1ms



Peaks
1. C8
2. C10
3. C12
4. C14
5. C16
6. C18
7. C20
8. C22
9. C24
10. C26
11. C28
12. C30
13. C32
14. C34
15. C36
16. C38
17. C40

Column	Rxi®-1ms, 20 m, 0.18 mm ID, 0.18 µm (cat.# 13302)
Sample	Florida TRPH standard (cat.# 31266)
Diluent:	Hexane
Conc.:	500 µg/mL
Injection	
Inj. Vol.:	0.5 µL split (split ratio 20:1)
Liner:	3.5 mm split Precision® liner w/wool (cat.# 21021)
Inj. Temp.:	275 °C
Oven	
Oven Temp:	40 °C (hold 1 min) to 330 °C at 20 °C/min (hold 10 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	55 cm/sec @ 40 °C
Detector	FID @ 350 °C
Instrument	Shimadzu 2010 GC
Acknowledgement	GC courtesy of Shimadzu Scientific.

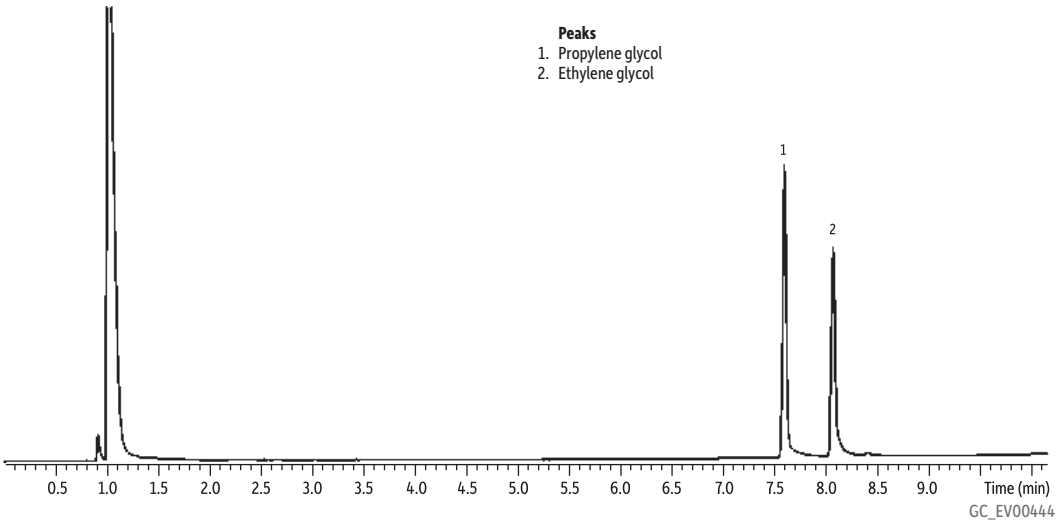
Lubrication Range Organics Diesel Fuel #2/Motor Oil on Rxi®-1ms



Peaks
1. Diesel fuel #2 composite
2. Motor oil

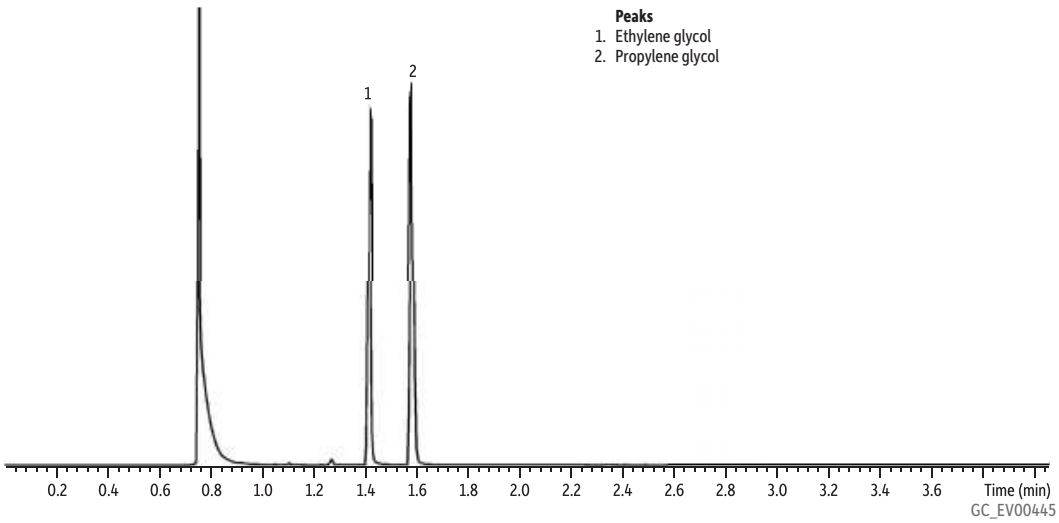
Column	Rxi®-1ms, 20 m, 0.18 mm ID, 0.18 µm (cat.# 13302)
Sample	Diesel #2/motor oil (cat.# 31682)
Diluent:	Hexane
Conc.:	5,000 µg/mL
Injection	
Inj. Vol.:	0.5 µL split (split ratio 20:1)
Liner:	3.5 mm split Precision® liner w/wool (cat.# 21021)
Inj. Temp.:	275 °C
Oven	
Oven Temp:	40 °C (hold 1 min) to 330 °C at 20 °C/min (hold 10 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	55 cm/sec @ 40 °C
Detector	FID @ 350 °C
Instrument	Shimadzu 2010 GC

Glycols on Rtx®-Wax



Column	Rtx®-Wax, 30 m, 0.53 mm ID, 1.00 µm (cat.# 12455)
Sample	
Conc.:	100 µg/mL each
Injection	Direct
Inj. Temp.:	220 °C
Oven	
Oven Temp:	80 °C (hold 1 min) to 120 °C at 8 °C/min (hold 3 min)
Detector	FID @ 270 °C
Notes	10 psi pressure

Glycols on Rtx®-200

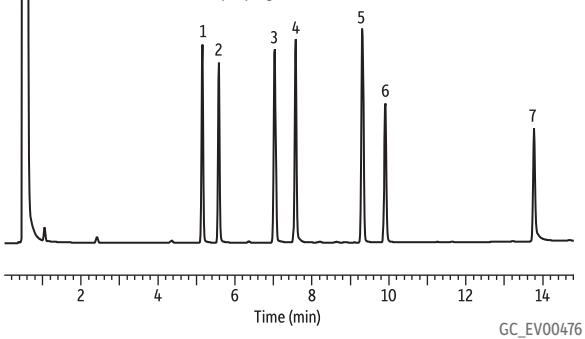


Column	Rtx®-200, 30 m, 0.53 mm ID, 1.00 µm (cat.# 15055)
Sample	
Conc.:	100 µg/mL each
Injection	Direct
Inj. Temp.:	220 °C
Oven	
Oven Temp:	80 °C (hold 1 min) to 200 °C at 8 °C/min (hold 3 min)
Detector	FID @ 270 °C
Notes	10 psi pressure

Glycols on Stabilwax®

Peaks
1. 1,2-Propylene glycol
2. Ethylene glycol
3. 1,3-Butylene glycol
4. 1,3-Propylene glycol
5. 1,4-Butylene glycol
6. Diethylene glycol
7. Glycerol

Column	Stabilwax®, 30 m, 0.53 mm ID, 1.00 µm (cat.# 10655)
Sample	Glycol mix
Diluent:	Water:methanol (50:50)
Conc.:	150 ppm
Injection	
Inj. Vol.:	1.0 µL direct
Liner:	Open-top Uniliner® liner without wool (cat.# 20843-205)
Oven	
Oven Temp:	80 °C to 200 °C at 8 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Flow Rate:	6.9 mL/min
Linear Velocity:	50 cm/sec
Detector	FID @ 270 °C
Make-up Gas Flow Rate:	45 mL/min
Notes	Septa purge = 5.0 cc/min

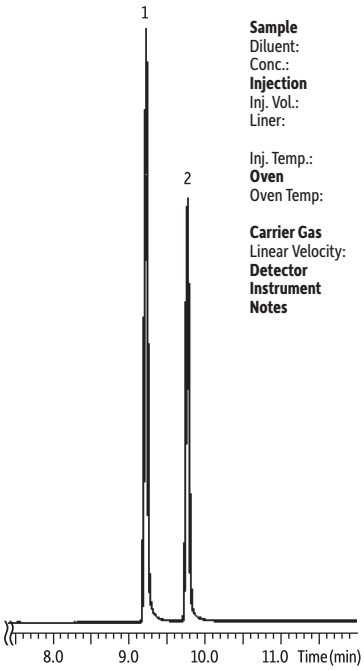


GC_EV00476

Glycols on Stabilwax®

Peaks
1. Propylene glycol
2. Ethylene glycol

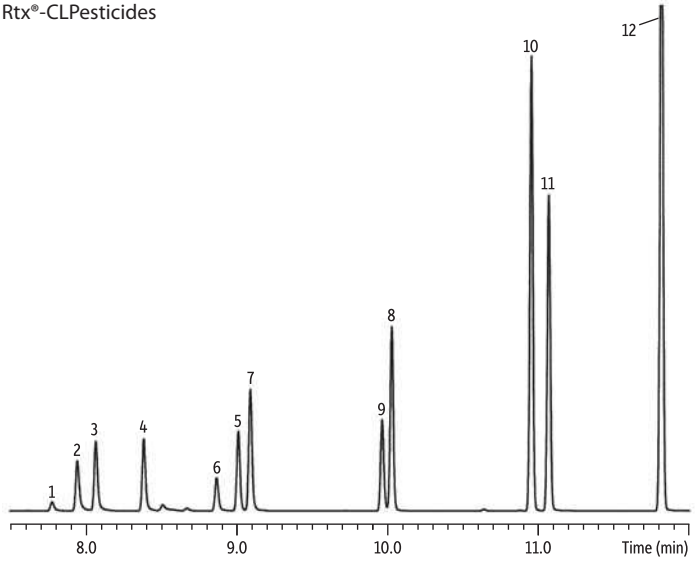
Column	Stabilwax®, 30 m, 0.53 mm ID, 1.0 µm (cat.# 10655)
Sample	Glycols
Diluent:	Water
Conc.:	100 ppm
Injection	
Inj. Vol.:	1.0 µL direct
Liner:	Open-top Uniliner® inlet liner without wool (cat.# 20843-205)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	80 °C (hold 1 min) to 200 °C at 8 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	50 cm/sec
Detector	FID @ 250 °C
Instrument	Agilent/HP6890 GC
Notes	Septum Purge: 5.0 cc/min



GC_EV00546

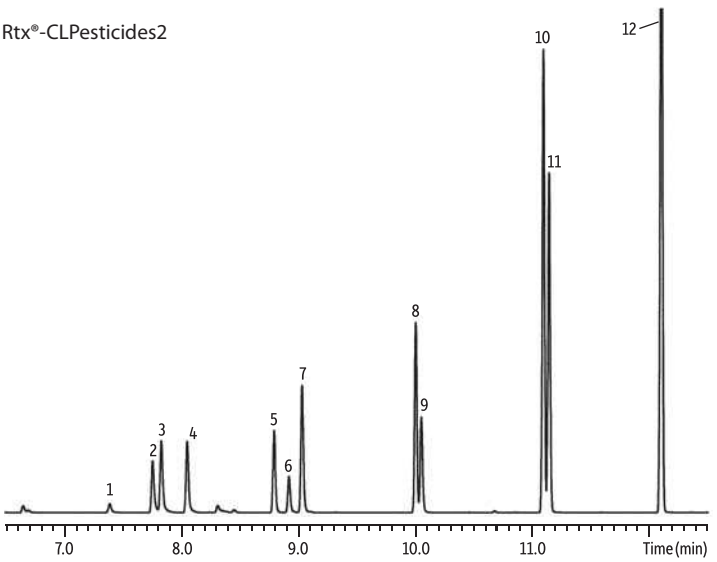
Haloacetic Acids & Dalapon by EPA Method 552.2 on Rtx®-CLPesticides & Rtx®-CLPesticides2

Rtx®-CLPesticides



GC_EV01006

Rtx®-CLPesticides2



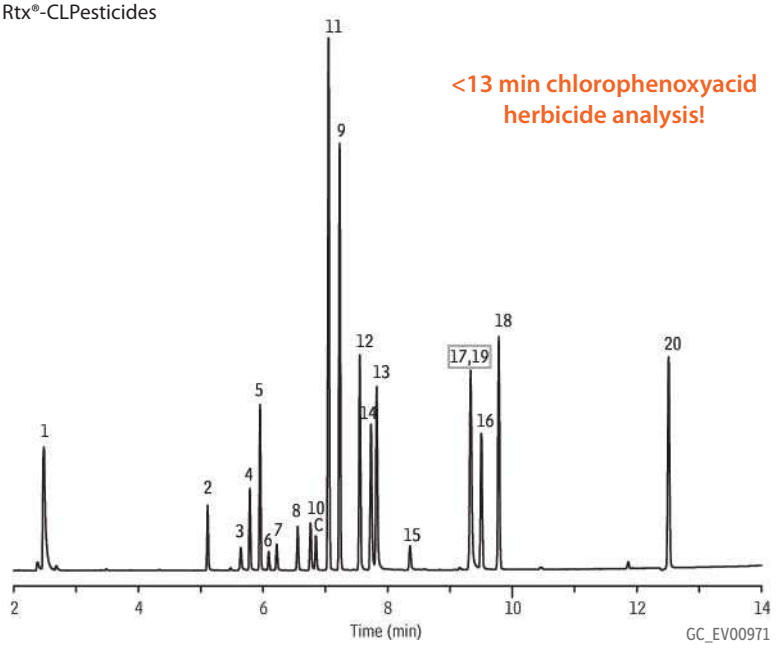
GC_EV01007

Peaks		Conc. (µg/mL)
1.	Methyl monochloroacetate	1.2
2.	Methyl monobromoacetate	0.8
3.	Methyl dichloroacetate	1.2
4.	Dalapon methyl ester	2
5.	Methyl trichloroacetate	0.4
6.	1,2,3-Trichloropropane (IS)	4
7.	Methyl bromo(chloro)acetate	0.8
8.	Methyl bromodichloroacetate	0.8
9.	Methyl dibromoacetate	0.4
10.	Methyl chlorodibromoacetate	2
11.	Methyl 2,3-dibromopropionate (SS)	2
12.	Methyl tribromoacetate	4

Columns	Rtx®-CLPesticides2 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324) and Rtx®-CLPesticides 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141) using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039) with deactivated universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample	Haloacetic acid methyl ester mix #2 (cat.# 31647) Dalapon methyl ester (cat.# 32057) Methyl-2,3-dibromopropionate (cat.# 31656) 1,2,3-Trichloropropane (cat.# 31648)
Diluent:	Methyl *tert*-butyl ether (MTBE)
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20896)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	35 °C (hold 4 min) to 250 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Linear Velocity:	25 cm/sec
Detector	µ-ECD @ 300 °C
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

Herbicides on Rtx®-CLPesticides & Rtx®-CLPesticides2

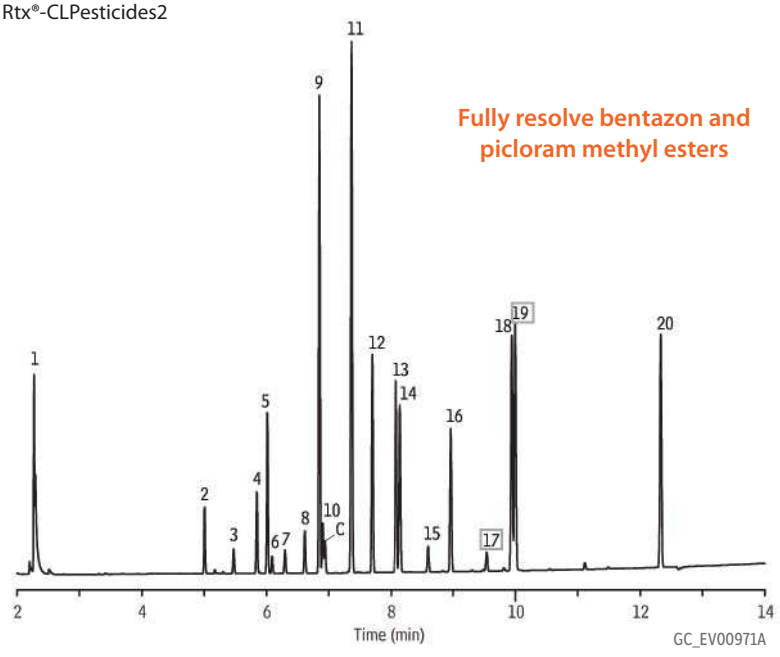
Rtx®-CLPesticides



Peaks
1. Dalapon methyl ester
2. 3,5-Dichlorobenzoic acid methyl ester (SS)
3. 4-Nitroanisole
4. DCAA methyl ester (SS)
5. Dicamba methyl ester
6. MCPP methyl ester
7. MCPA Methyl ester
8. Dichlorprop, methyl ester
9. 4,4'-DBOB (IS)
10. 2,4-D methyl ester
11. Pentachloroanisole
12. 2,4,5-TP, methyl ester
13. 2,4,5-T methyl ester
14. Chloramben, methyl ester
15. 2,4-DB methyl ester
16. Dinoseb methyl ester
17. Bentazon methyl ester
18. DCPA
19. Pichloram methyl ester
20. Acifluorfen methyl ester

C. contaminant

Rtx®-CLPesticides2



Columns	Rtx®-CLPesticides2 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324) and Rtx®-CLPesticides 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141) using Rxi® deactivated guard column 5 m, 0.32 mm ID (cat.# 10039) with universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample	200 ng/mL herbicide mix #1 (cat.# 32055) 1,000 ng/mL dalapon methyl ester (cat.# 32057) 20,000 ng/mL herbicide mix #3 (cat.# 32059) 200 ng/mL herbicide mix #4 (cat.# 32062) 250 ng/mL 4,4'-dibromooctafluorobiphenyl (cat.# 32053) 400 ng/mL 2,4-dichlorophenyl acetic acid methyl ester (cat.# 32050)
Diluent:	Hexane
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20895)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	70 °C (hold 0.5 min) to 190 °C at 25 °C/min (hold 1 min) to 300 °C at 11 °C/min (hold 5 min)
Carrier Gas	He, constant pressure
Linear Velocity:	36 cm/sec @ 70 °C
Detector	µ-ECD @ 325 °C
Instrument	Agilent/HP6890 GC
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

also see:

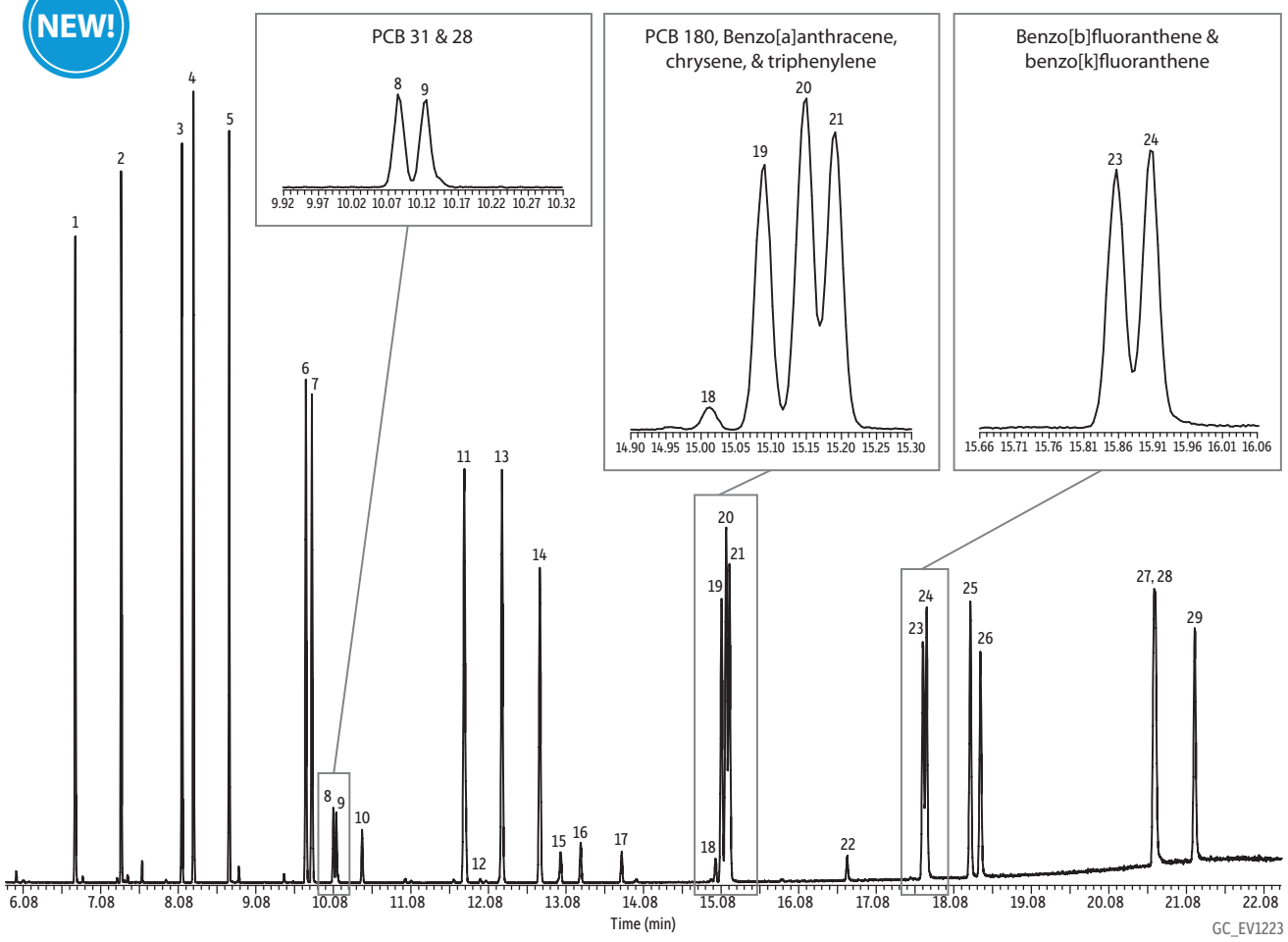
Pesticides & Herbicides
page **610**

PAH and PCB Mixtures

PAHs and PCB Congeners on Rxi®-XLB

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

NEW!



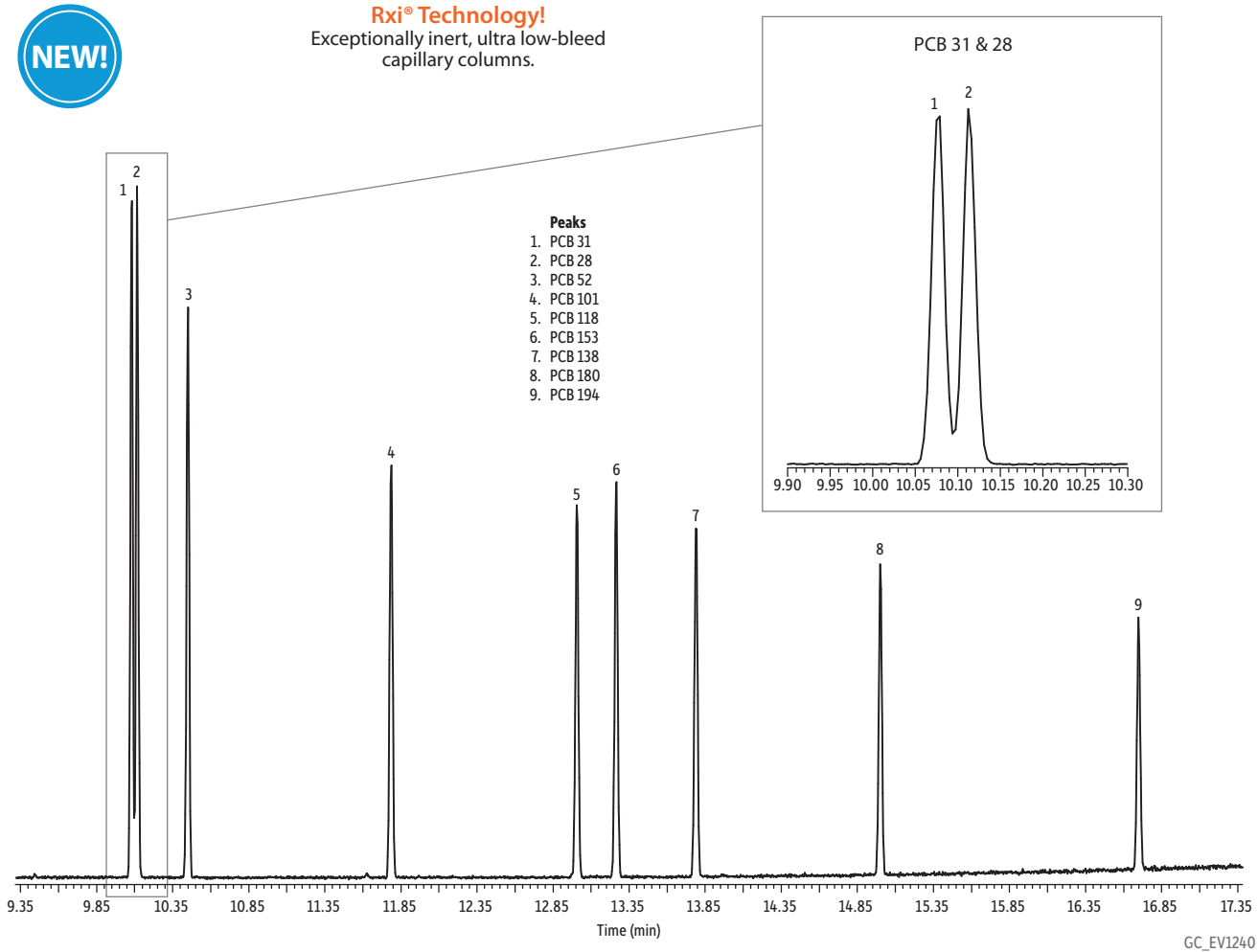
Column	Rxi®-XLB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723)
Sample	SV calibration mix #5 / 610 PAH mix (cat.# 31011) Benzo(e)pyrene (cat.# custom) Triphenylene (cat.# custom) 2-Methylnaphthalene (cat.# 31285) 2-Methylfluoranthene (cat.# custom) PCB congener standard #2 (cat.# 32294) PCB 31 (cat.# custom)
Diluent:	Dichloromethane
Injection	
Inj. Vol.:	0.5 µL splitless (hold 1.75 min)
Liner:	2.0 mm ID straight inlet liner w/wool (cat.# 21718)
Inj. Temp.:	300 °C
Purge Flow:	50 mL/min
Oven	
Oven Temp:	40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	300 °C
Analyzer Type:	Quadrupole
Source Temp.:	280 °C
Electron Energy:	70 eV
Solvent Delay Time:	4 min
Tune Type:	manual
Ionization Mode:	EI
Scan Range:	45-550 amu
Scan Rate:	5 scans/sec
Instrument	PE Clarus 500 GC & Clarus 500 MS

	Peaks	Conc. (µg/mL)
1.	Naphthalene	5
2.	2-Methylnaphthalene	5
3.	Acenaphthylene	5
4.	Acenaphthene	5
5.	Fluorene	5
6.	Phenanthrene	5
7.	Anthracene	5
8.	PCB 31	1
9.	PCB 28	1
10.	PCB 52	1
11.	Fluoranthene	5
12.	PCB 101	1
13.	Pyrene	5
14.	2-Methylfluoranthene	5
15.	PCB 118	1
16.	PCB 153	1
17.	PCB 138	1
18.	PCB 180	1
19.	Benzo[a]anthracene	5
20.	Chrysene	5
21.	Triphenylene	5
22.	PCB 194	1
23.	Benzo[b]fluoranthene	5
24.	Benzo[k]fluoranthene	5
25.	Benzo[e]pyrene	5
26.	Benzo[a]pyrene	5
27.	Dibenzo[a,h]anthracene	5
28.	Indeno[1,2,3-cd]pyrene	5
29.	Benzo[g,h,i]perylene	5

EU PCB Congeners on Rxi®-XLB

NEW!

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.



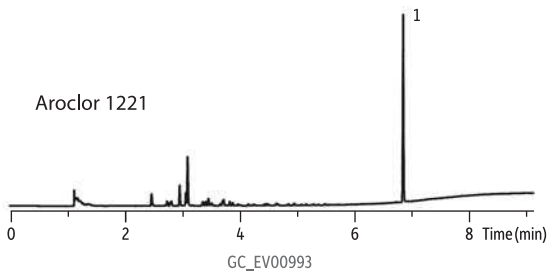
GC_EV1240

Column	Rxi®-XLB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723)
Sample	PCB congener standard #2 (cat.# 32294) PCB 31 (cat.# custom)
Diluent:	Dichloromethane
Conc.:	3.5 ppm
Injection	
Inj. Vol.:	0.5 µL splitless (hold 1.75 min)
Liner:	2.0 mm ID straight inlet liner w/wool (cat.# 21718)
Inj. Temp.:	300 °C
Purge Flow:	50 mL/min
Oven	
Oven Temp:	40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	300 °C
Analyzer Type:	Quadrupole
Source Temp.:	280 °C
Electron Energy:	70 eV
Ionization Mode:	EI
Scan Range:	45-550 amu
Scan Rate:	5 scans/sec
Instrument	PE Clarus 500 GC & Clarus 500 MS

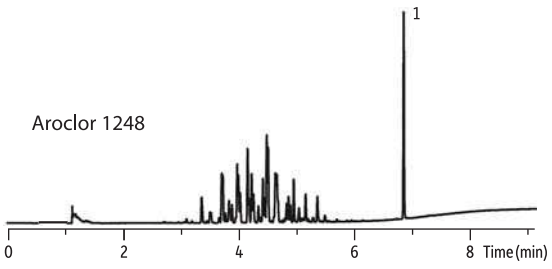
Aroclor PCBs on Rtx®-CLPesticides

Rtx®-CLPesticides
30 m, 0.32 mm ID, 0.32 µm (cat.# 11141)

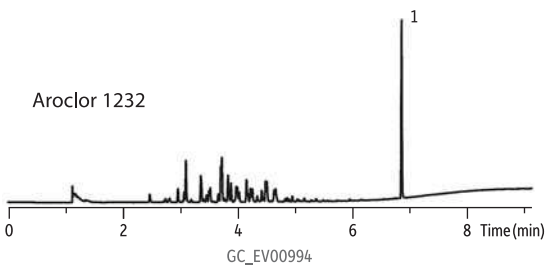
Peaks
1. Decachlorobiphenyl (DCB)



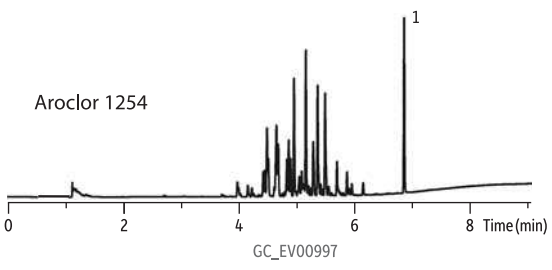
GC_EV00993



GC_EV00996



GC_EV00994



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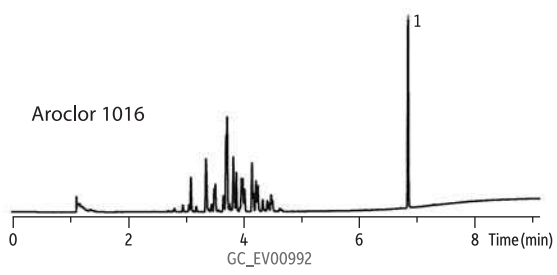
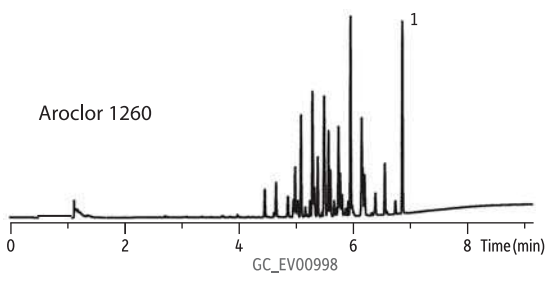
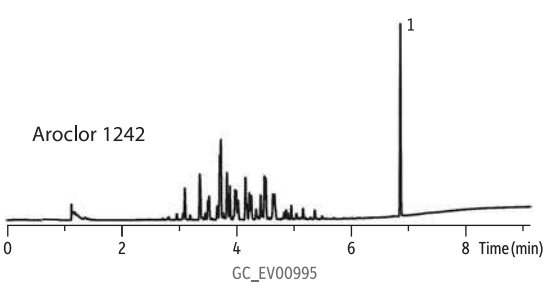


GC_EV00992



GC_EV00998



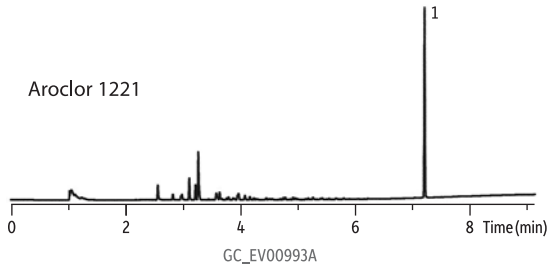
GC_EV00995

Column	Rtx®-CLPesticides, 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141)
Sample	PCB kit #1 diluted to 1,000 ppb in hexane (cat.# 32089) Decachlorobiphenyl (BZ #209) diluted to 100 ppb in acetone (cat.# 32029)
Injection	
Inj. Vol.:	1.0 µL pulsed splitless (hold 0.3 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20895)
Inj. Temp.:	250 °C
Pulse Pressure:	30 psi (206.8 kPa)
Oven	
Oven Temp:	120 °C to 200 °C at 45 °C/min to 230 °C at 15 °C/min to 330 °C at 30 °C/min (hold 2 min)
Carrier Gas	He, constant flow
Linear Velocity:	60 cm/sec
Detector	µ-ECD @ 330 °C
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

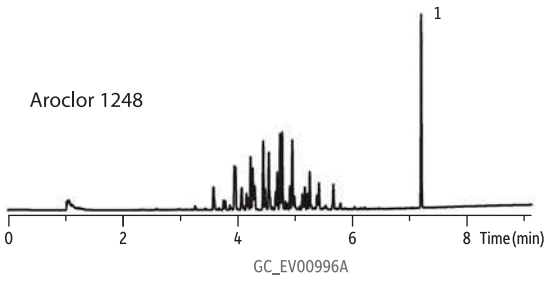
Aroclor PCBs on Rtx®-CLPesticides2

Rtx®-CLPesticides2
30 m, 0.32 mm ID, 0.25 µm (cat.# 11324)

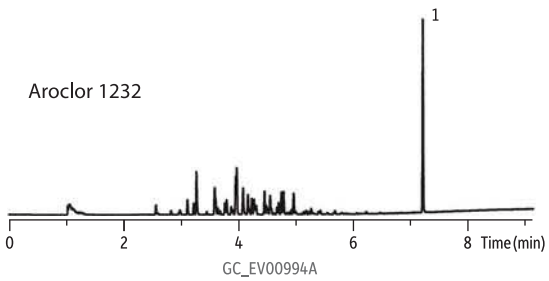
Peaks
1. Decachlorobiphenyl (DCB)



GC_EV00993A



GC_EV00996A



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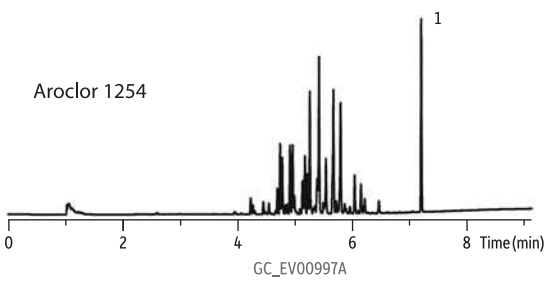
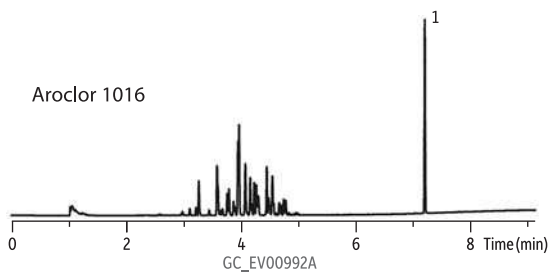
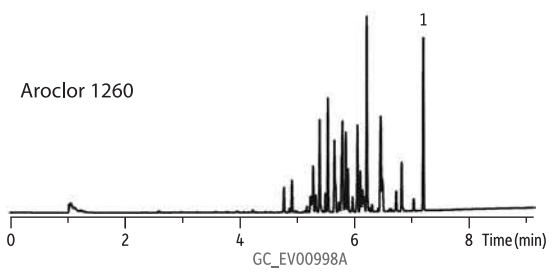


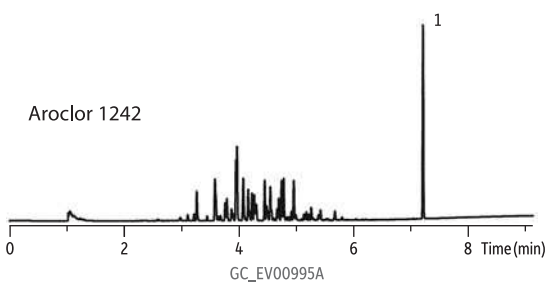
GC_EV00997A



GC_EV00992A



GC_EV00998A



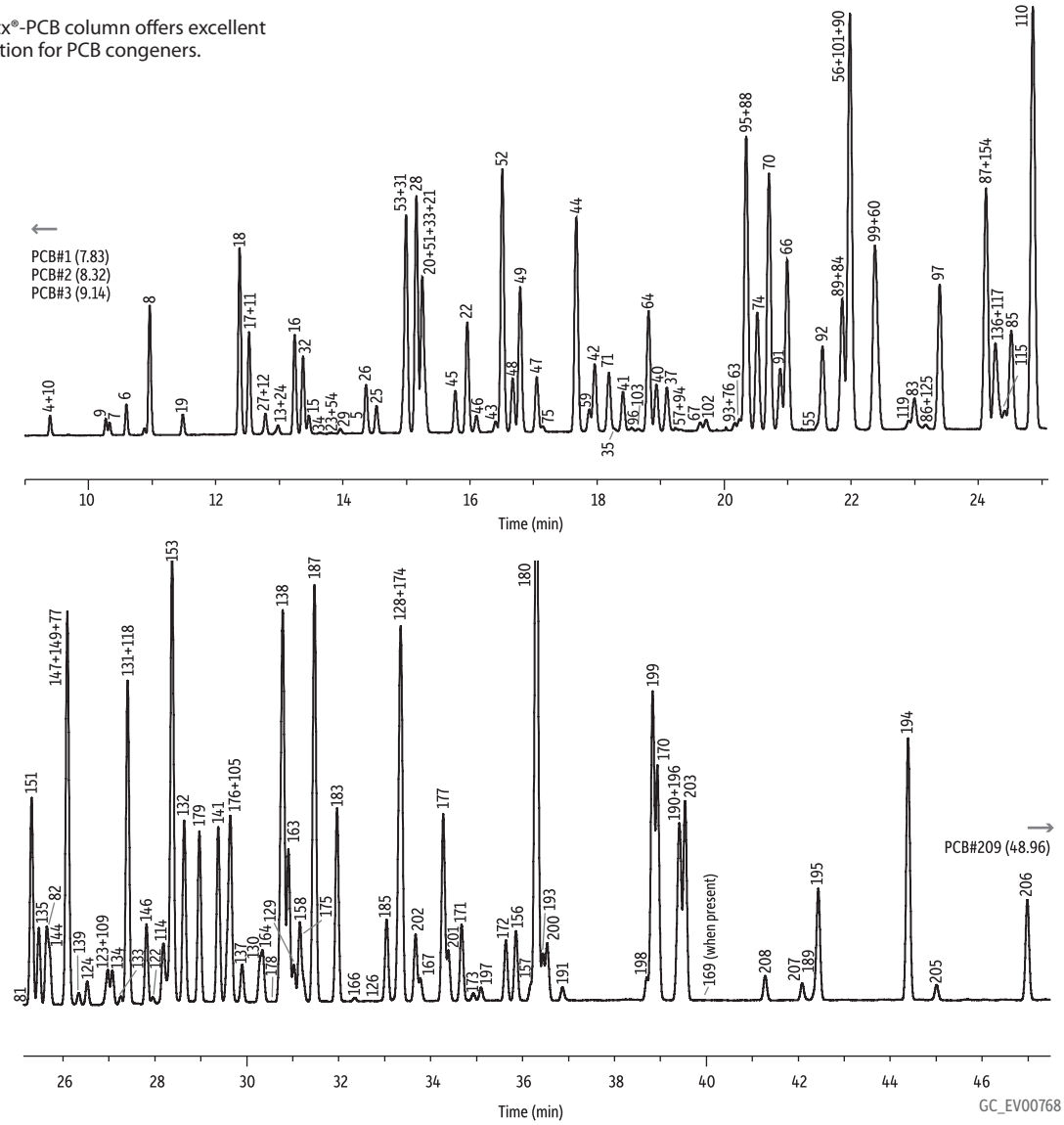
GC_EV00995A

Column	Rtx®-CLPesticides2, 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324)
Sample	PCB kit #1 diluted to 1,000 ppb in hexane (cat.# 32089) Decachlorobiphenyl (BZ #209) diluted to 100 ppb in acetone (cat.# 32029)
Injection	
Inj. Vol.:	1.0 µL pulsed splitless (hold 0.3 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20895)
Inj. Temp.:	250 °C
Pulse Pressure:	30 psi (206.8 kPa)
Oven	
Oven Temp:	120 °C to 200 °C at 45 °C/min to 230 °C at 15 °C/min to 330 °C at 30 °C/min (hold 2 min)
Carrier Gas	He, constant flow
Linear Velocity:	60 cm/sec
Detector	µ-ECD @ 330 °C
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

Aroclor 1242/1254/1262 PCBs on Rtx®-PCB

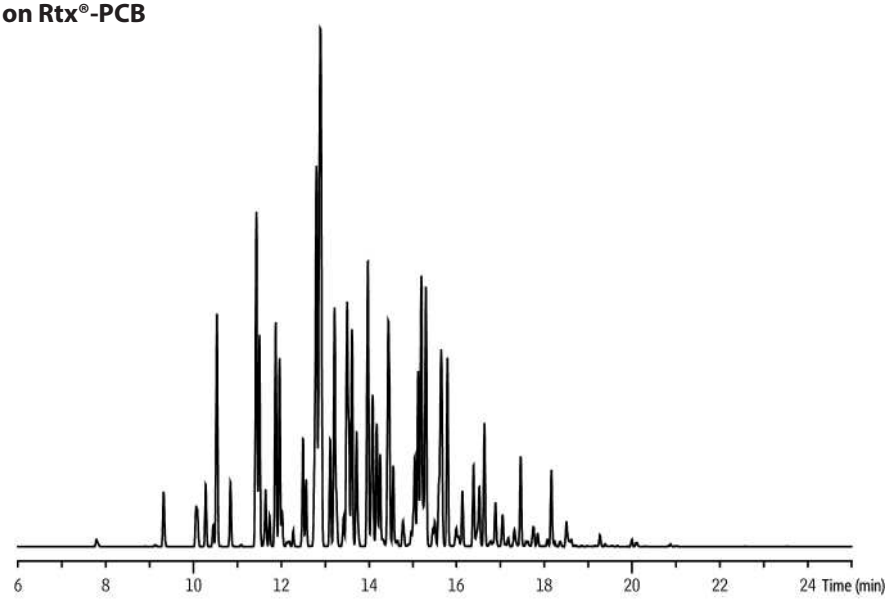
restek innovation!

The Rtx®-PCB column offers excellent resolution for PCB congeners.



Column	Rtx®-PCB, 40 m, 0.18 mm ID, 0.18 µm (cat.# 41303)
Sample	Aroclor 1242 (cat.# 32009) Aroclor 1254 (cat.# 32011) Aroclor 1262 (cat.# 32409)
Diluent:	Hexane
Conc.:	300 ng/mL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	Recessed taper (4 mm) (cat.# 20983)
Inj. Temp.:	230 °C
Oven	
Oven Temp:	100 °C (hold 1 min) to 200 °C at 30 °C/min to 320 °C at 2 °C/min (hold 1 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	40 cm/sec @ 100 °C
Detector	ECD @ 330 °C

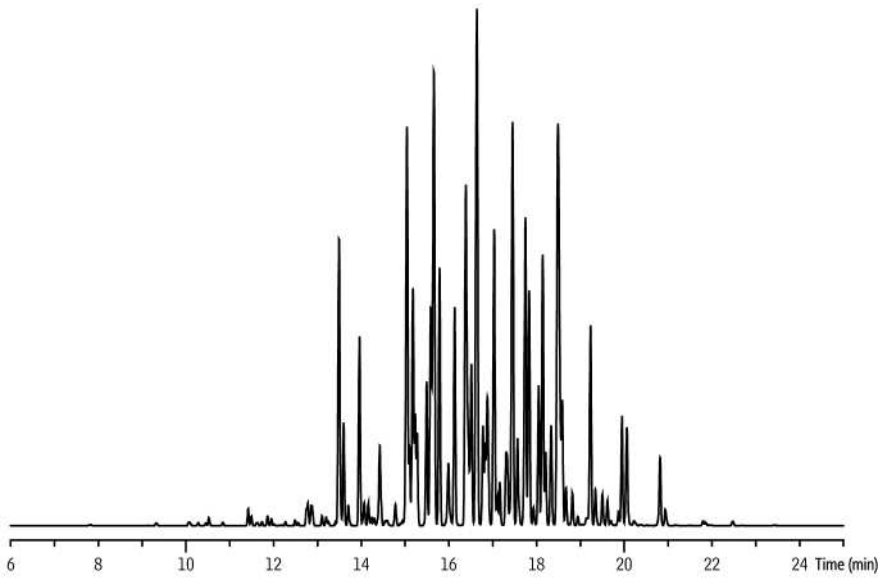
Aroclor 1242 PCBs on Rtx®-PCB



GC_EV00752

Column	Rtx®-PCB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13223)
Sample	Aroclor 1242 (cat.# 32009)
Conc.:	200 ng/mL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	3.5 mm ID single taper inlet liner (cat.# 20962)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C (hold 1.0 min) to 300 °C at 10 °C/min (hold 4 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	71 cm/sec @ 110 °C
Detector	ECD @ 310 °C

Aroclor 1254 PCBs on Rtx®-PCB

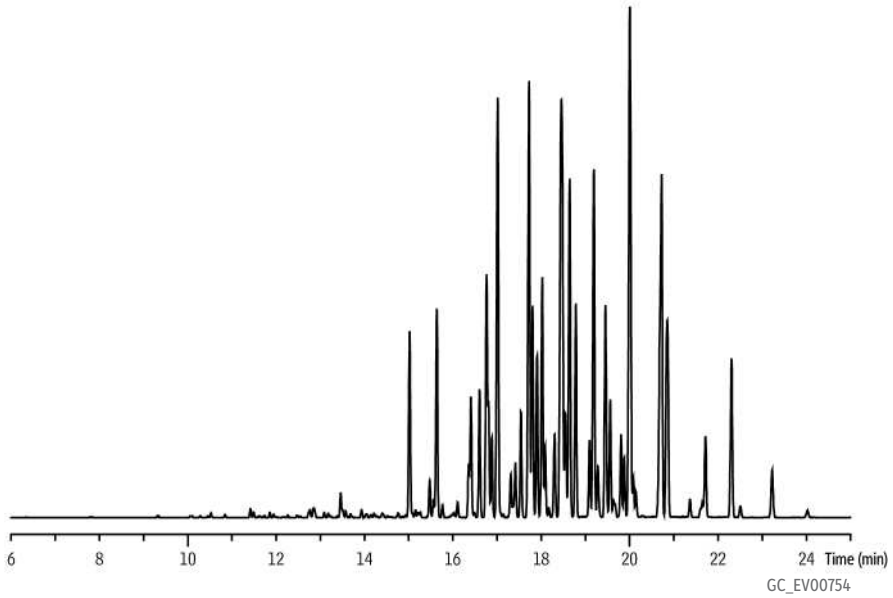


GC_EV00753

Column	Rtx®-PCB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13223)
Sample	Aroclor 1254 (cat.# 32011)
Conc.:	200 ng/mL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	3.5 mm ID single taper inlet liner (cat.# 20962)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C (hold 1.0 min) to 300 °C at 10 °C/min (hold 4 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	71 cm/sec @ 110 °C
Detector	ECD @ 310 °C

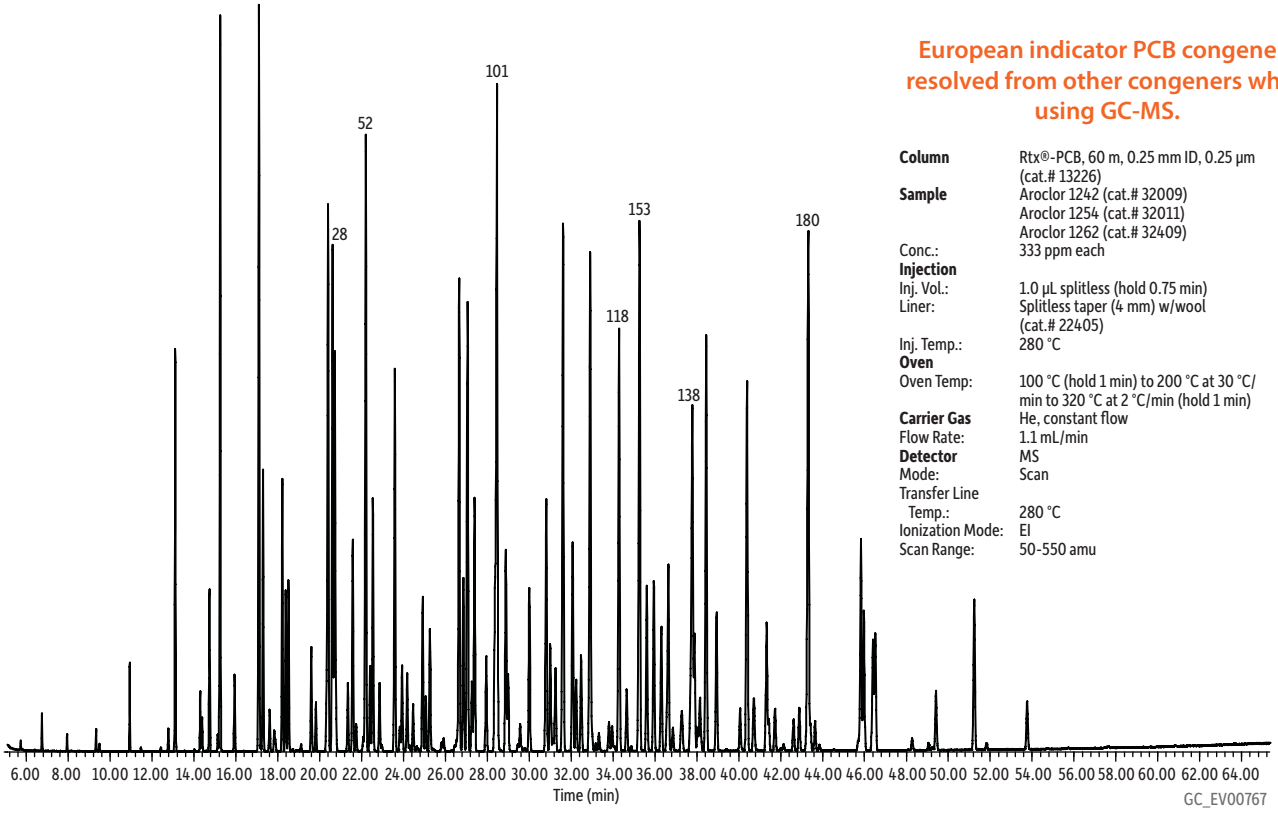
PCB Mixtures

Aroclor 1260 PCBs on Rtx®-PCB



Column	Rtx®-PCB, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13223)
Sample	Aroclor 1260 (cat.# 32012)
Conc.:	200 ng/mL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	3.5 mm ID single taper inlet liner (cat.# 20962)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	100 °C (hold 1.0 min) to 300 °C at 10 °C/min (hold 4 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	71 cm/sec @ 110 °C
Detector	ECD @ 310 °C

Aroclor PCBs on Rtx®-PCB

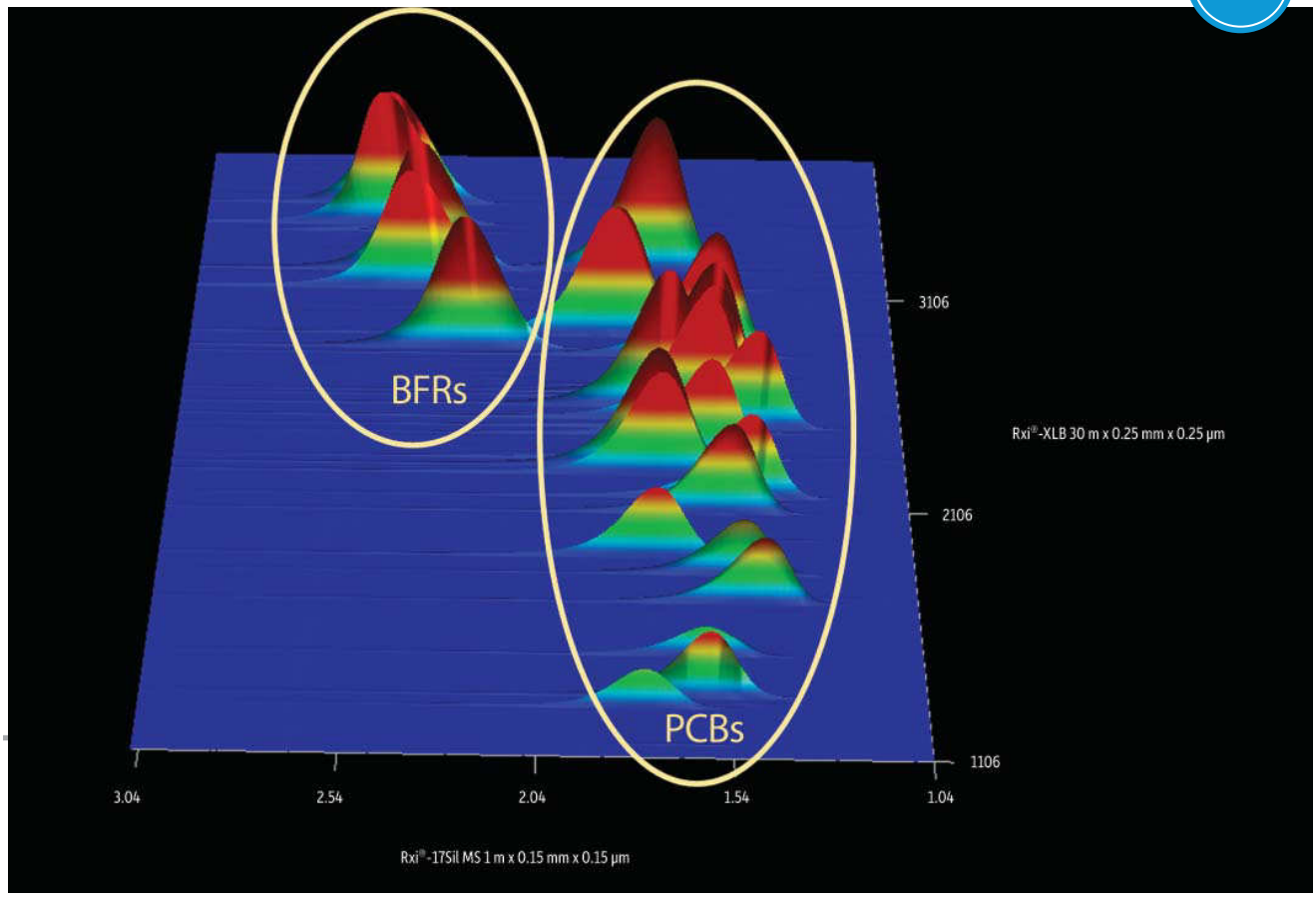


European indicator PCB congeners resolved from other congeners when using GC-MS.

Column	Rtx®-PCB, 60 m, 0.25 mm ID, 0.25 µm (cat.# 13226)
Sample	Aroclor 1242 (cat.# 32009) Aroclor 1254 (cat.# 32011) Aroclor 1262 (cat.# 32409)
Conc.:	333 ppm each
Injection	
Inj. Vol.:	1.0 µL splitless (hold 0.75 min)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	280 °C
Oven	
Oven Temp:	100 °C (hold 1 min) to 200 °C at 30 °C/min to 320 °C at 2 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.1 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Ionization Mode:	EI
Scan Range:	50-550 amu

PCBs and BFRs on Rxi®-XLB and Rxi®-17Sil MS (GCxGC)

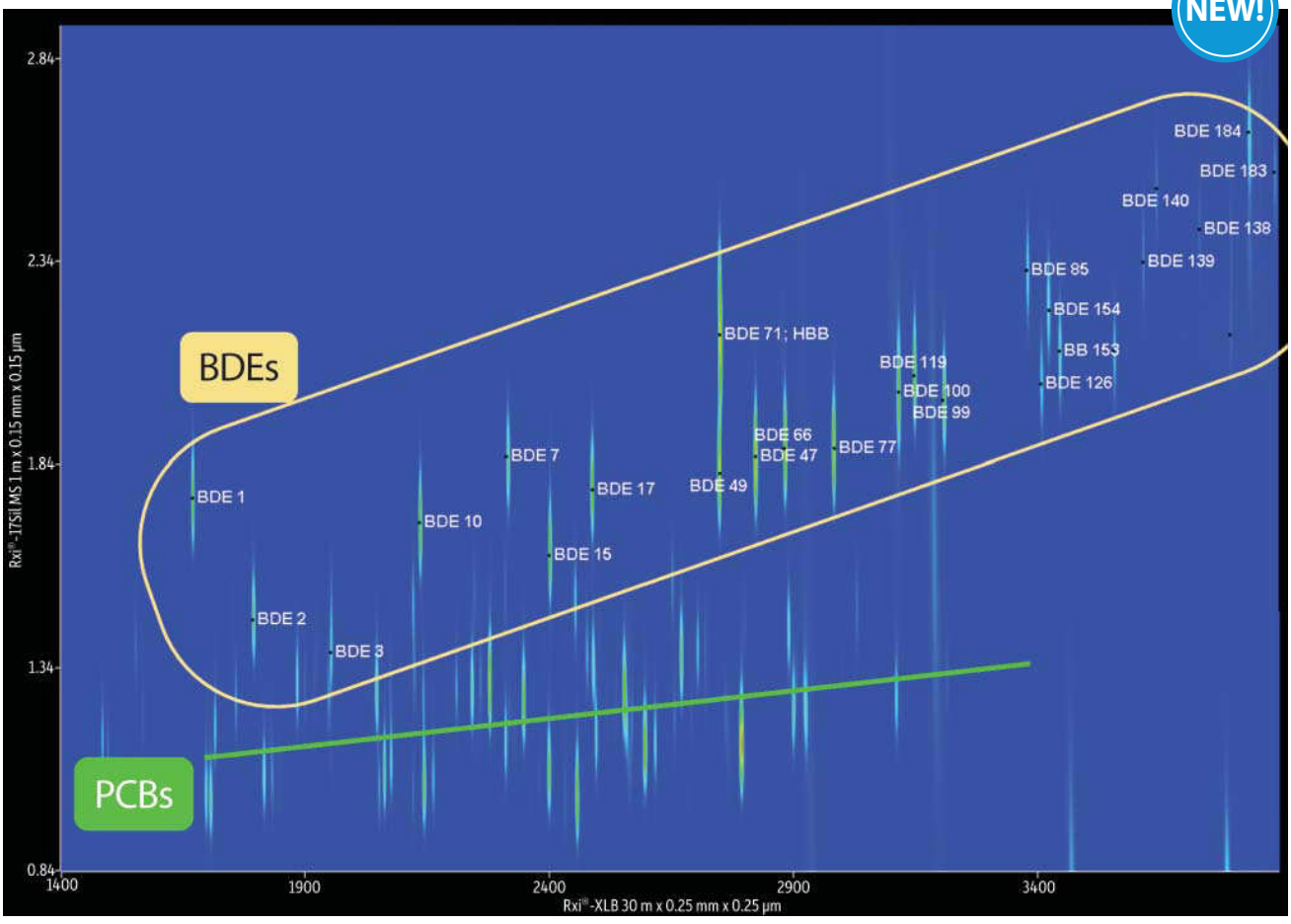
NEW!



GC_EV1237

Column	Rxi®-XLB 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723) Rxi®-17Sil MS 1 m, 0.15 mm ID, 0.15 µm (cat.# 43820) with IP deactivated guard column 0.2 m, 0.15 mm ID
Sample	PBDE mix (cat.# 33098) PCB congener mix, method 8082A (cat.# 32416)
Diluent:	Isooctane
Conc.:	250 pg/µL
Injection	
Inj. Vol.:	1.0 µL splitless (hold 1.0 min)
Liner:	Sky® 4 mm single taper w/wool (cat.# 23303.5)
Inj. Temp.:	250 °C
Purge Flow:	20 mL/min
Oven	
Oven Temp:	Rxi®-XLB: 80 °C (hold 1 min) to 120 °C at 10 °C/min to 300 °C at 3 °C/min Rxi®-17Sil MS: 85 °C (hold 1 min) to 125 °C at 10 °C/min to 305 °C at 3 °C/min
Carrier Gas	He, corrected constant flow (2.0 mL/min)
Modulation	
Modulator Temp. Offset:	20 °C
Second Dimension Separation Time:	3.5 sec
Hot Pulse Time:	1.25 sec
Cool Time between Stages:	0.50 sec
Detector	µ-ECD @ 325 °C
Data Rate:	50 Hz
Instrument	Agilent/HP6890 GC
Notes	The Rxi®-17Sil MS column (cat.# 43820) is a 10 m column. A 1 m section was used as a second dimension column. Guard column was connected using a Siltek®-treated universal Press-Tight® connector (cat.# 20480).

PCBs and BFRs on Rxi®-XLB and Rxi®-17Sil MS (GCxGC)



GC_EV1238

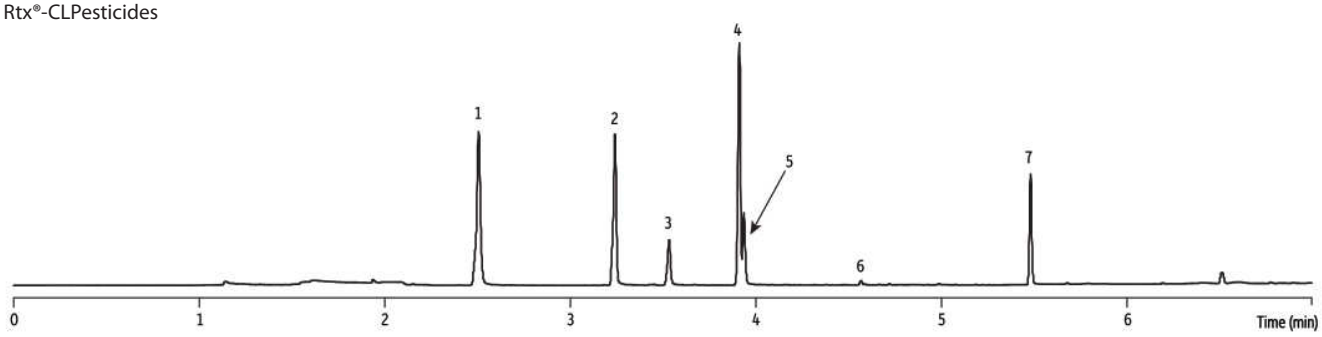
Column	Rxi®-XLB 30 m, 0.25 mm ID, 0.25 µm (cat.# 13723) Rxi®-17Sil MS 1 m, 0.15 mm ID, 0.15 µm (cat.# 43820) with IP deactivated guard column 0.2 m, 0.15 mm ID
Sample	Wellington BFR-PAR mix Aroclor
Diluent:	Isooctane
Injection	
Inj. Vol.:	1.0 µL splitless (hold 1.0 min)
Liner:	Sky® 4 mm single taper w/wool (cat.# 23303.5)
Inj. Temp.:	250 °C
Purge Flow:	20 mL/min
Oven	
Oven Temp:	Rxi®-XLB: 80 °C (hold 1 min) to 120 °C at 10 °C/min to 300 °C at 3 °C/min Rxi®-17Sil MS: 85 °C (hold 1 min) to 125 °C at 10 °C/min to 305 °C at 3 °C/min
Carrier Gas	He, corrected constant flow (2.0 mL/min)
Modulation	
Modulator Temp. Offset:	20 °C
Second Dimension Separation Time:	3.5 sec
Hot Pulse Time:	1.25 sec
Cool Time between Stages:	0.50 sec
Detector	µ-ECD @ 325 °C
Data Rate:	50 Hz
Instrument	Agilent/HP6890 GC
Notes	The Rxi®-17Sil MS column (cat.# 43820) is a 10 m column. A 1 m section was used as a second dimension column. Guard column was connected using a Siltek®-treated universal Press-Tight® connector (cat.# 20480).

Organochlorine Pesticides on Rtx®-CLPesticides and Rtx®-CLPesticides2 by EPA Method 504.1 (Dual Column Analysis)

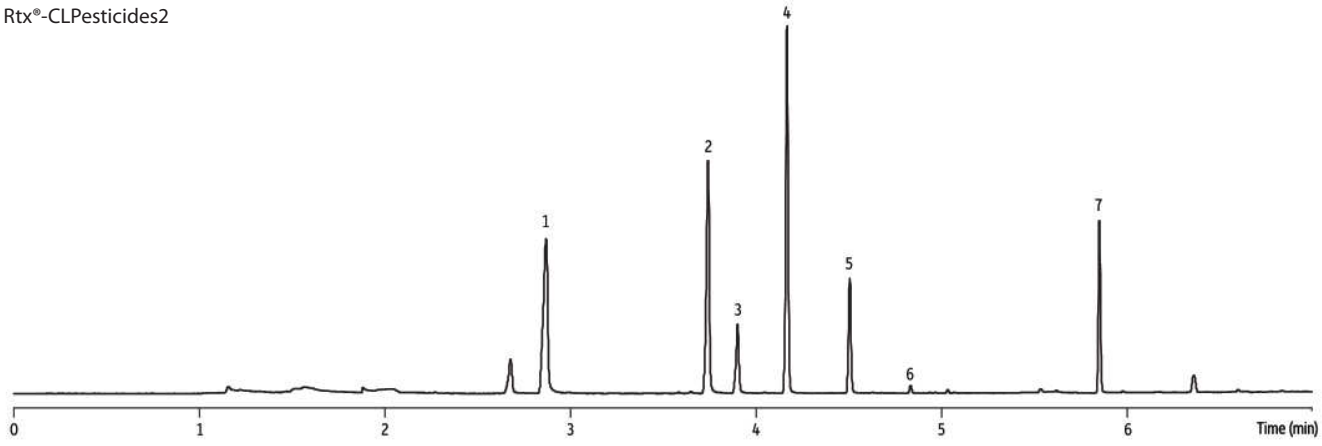
Peaks	CLP t_R (min)	CLP2 t_R (min)
1. Bromodichloromethane	2.504	2.866
2. Chlorodibromomethane	3.239	3.740
3. 1,2-Dibromoethane (EDB)	3.531	3.899
4. 1,1,1,2-Tetrachloroethane	3.910	4.166
5. Bromoform	3.935	4.505
6. 1,2,3-Trichloropropane	4.655	4.833
7. 1,2-Dibromo-3-chloropropane (DBCP)	5.480	5.850

NEW!

Rtx®-CLPesticides



Rtx®-CLPesticides2

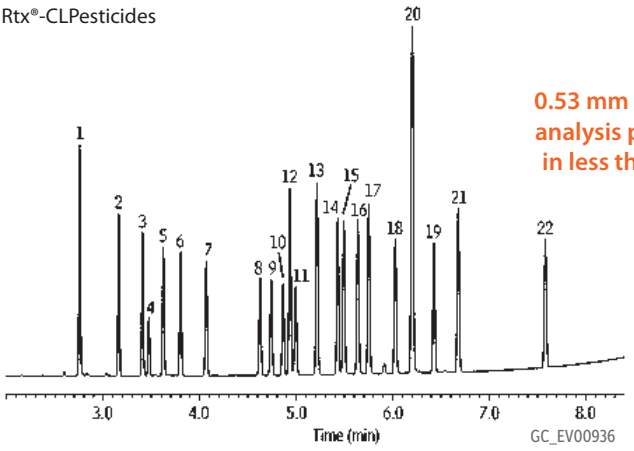


GC_EV1227

Columns	Rtx®-CLPesticides2 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324) and Rtx®-CLPesticides 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141) using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039) with Universal "Y" Press-Tight® connector (cat.# 20405)
Sample	Dibromochloromethane (chlorodibromochloromethane) (cat.# 30271) Bromodichloromethane (cat.# 30251) 504.1 calibration mix (cat.# 30239) 1,1,1,2-tetrachloroethane (cat.# 30411) Bromoform (cat.# 30252)
Diluent:	*n*-Hexane
Conc.:	10 ng/mL
Injection	
Inj. Vol.:	2 µL splitless (hold 0.50 min)
Liner:	Sky® 4 mm single taper inlet liner w/wool (cat.# 23303.1)
Inj. Temp.:	200 °C
Purge Flow:	50 mL/min
Oven	
Oven Temp:	30 °C (hold 2.0 min) to 220 °C at 30 °C/min
Carrier Gas	He, constant flow
Flow Rate:	5.0 mL/min
Linear Velocity:	60 cm/sec
Detector	µ-ECD @ 220 °C
Make-up Gas Flow Rate:	50 mL/min
Make-up Gas Type:	He
Data Rate:	50 Hz
Instrument	Agilent/HP6890 GC
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual-columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

Organochlorine Pesticide Mix AB #2 on Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.53 mm ID column set)

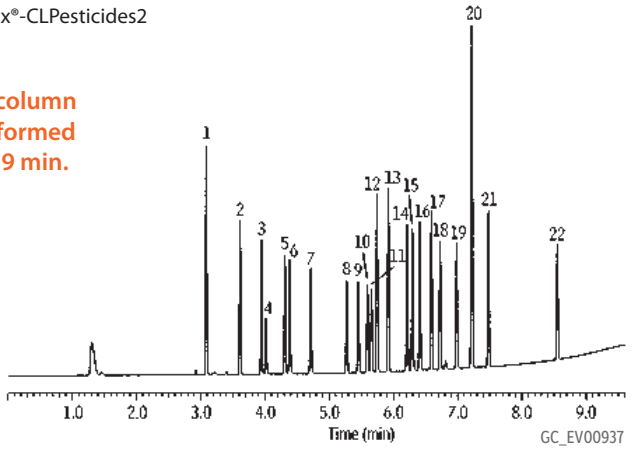
Rtx®-CLPesticides



GC_EV00936

0.53 mm ID column analysis performed in less than 9 min.

Rtx®-CLPesticides2



GC_EV00937

Columns Rtx®-CLPesticides 30 m, 0.53 mm ID, 0.50 µm (cat.# 11140)
and Rtx®-CLPesticides2 30 m, 0.53 mm ID, 0.42 µm (cat.# 11340)
using Rxi® guard column 5 m, 0.53 mm ID (cat.# 10054)
with Siltek® treated universal "Y" Press-Tight® connector (cat.# 20486)

Sample Organochlorine pesticide mix AB #2 (8-80 µg/mL in hexane/toluene) (cat.# 32292)
Pesticide surrogate mix, EPA 8080, 8081 (200 µg/mL in acetone) (cat.# 32000)

Injection
Inj. Vol.: 1.0 µL splitless (hold 0.3 min)
Liner: Splitless taper (4 mm) (cat.# 20799)
Inj. Temp.: 250 °C

Oven
Oven Temp: 120 °C to 200 °C at 45 °C/min to 230 °C at 12.5 °C/min to 325 °C at 30 °C/min (hold 2 min)

Carrier Gas He, constant linear velocity
Linear Velocity: 45 cm/sec @ 120 °C

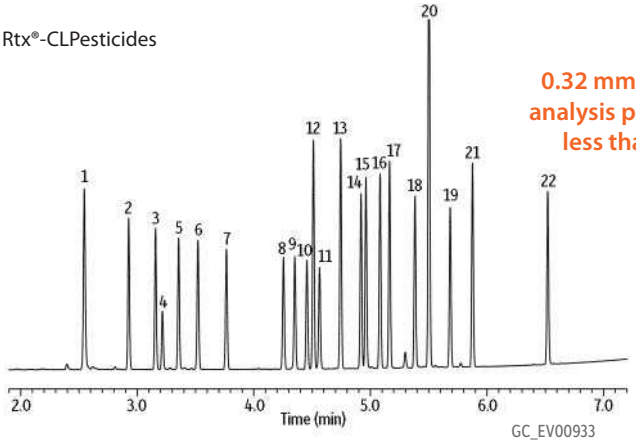
Detector µ-ECD @ 330 °C

Notes This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

Peaks
1. 2,4,5,6-Tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide (isomer B)
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. 4,4'-DDT
18. Endrin aldehyde
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (SS)

Organochlorine Pesticide Mix AB #2 on Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.32 mm ID column set)

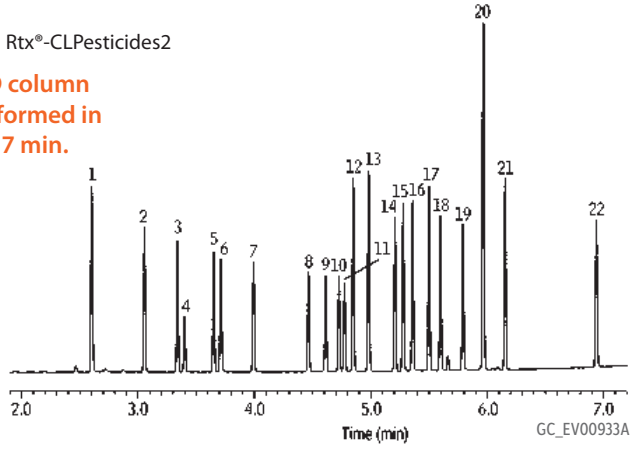
Rtx®-CLPesticides



GC_EV00933

0.32 mm ID column analysis performed in less than 7 min.

Rtx®-CLPesticides2



GC_EV00933A

Columns Rtx®-CLPesticides 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141)
and Rtx®-CLPesticides2 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324)
using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039)
with deactivated universal "Y" Press-Tight® connector (cat.# 20405-261)

Sample Organochlorine pesticide mix AB #2 (cat.# 32292)
Pesticide surrogate mix, EPA 8080, 8081 (cat.# 32000)

Injection
Inj. Vol.: 1 µL splitless (hold 0.3 min)
Liner: Splitless taper (4 mm) (cat.# 20799)
Inj. Temp.: 250 °C

Oven
Oven Temp: 120 °C to 200 °C at 45 °C/min to 230 °C at 15 °C/min to 330 °C at 30 °C/min (hold 2 min)

Carrier Gas He

Detector µ-ECD @ 330 °C

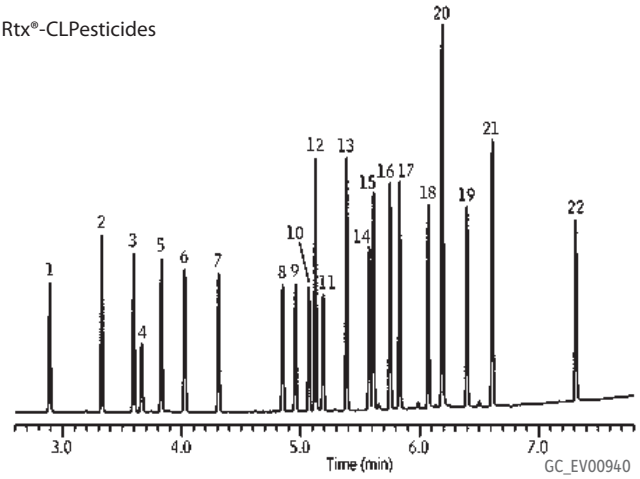
Notes Instrument was operated in constant flow mode.
Linear velocity: 60 cm/sec @ 120 °C.

This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual-columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

Peaks
1. 2,4,5,6-Tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide (isomer B)
9. *trans*-Chlordane
10. *cis*-Chlordane
11. Endosulfan I
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. 4,4'-DDT
18. Endrin aldehyde
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (SS)

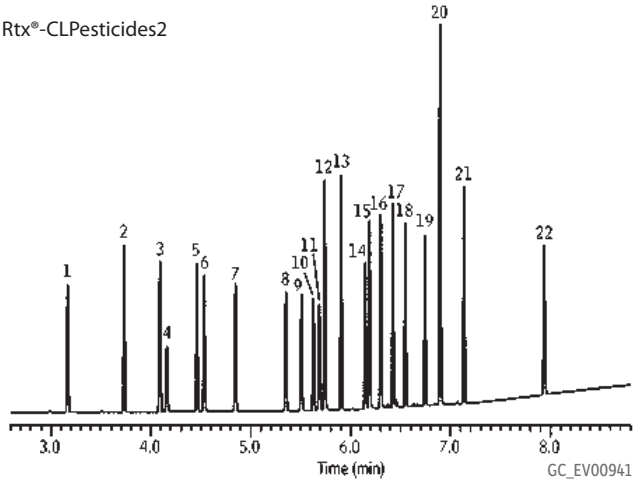
Organochlorine Pesticide Mix AB #2 on Rtx®-CLPesticides and Rtx®-CLPesticides2 (0.25 mm ID column set)

Rtx®-CLPesticides



GC_EV00940

Rtx®-CLPesticides2



GC_EV00941

Columns Rtx®-CLPesticides 30 m, 0.25 mm ID, 0.25 µm (cat.# 11123)
and Rtx®-CLPesticides2 30 m, 0.25 mm ID, 0.20 µm (cat.# 11323)
using Rxi® guard column 5 m, 0.25 mm ID (cat.# 10029)
with Siltek® treated universal "Y" Press-Tight® connector (cat.# 20486)

Sample Organochlorine pesticide mix AB #2, 8–80 µg/mL each component in hexane/toluene (cat.# 32292)
Pesticide surrogate mix, EPA 8080, 8081 pesticide surrogate mix, 200 µg/mL each component in acetone (cat.# 32000)

Injection
Inj. Vol.: 0.5 µL splitless (hold 0.5 min)
Liner: Cyclo double taper (2 mm) (cat.# 20908)
Inj. Temp.: 250 °C

Oven
Oven Temp: 125 °C to 200 °C at 45 °C/min to 230 °C at 12.5 °C/min to 330 °C at 30 °C/min (hold 2 min)

Carrier Gas He, constant linear velocity
Linear Velocity: 41 cm/sec @ 125 °C

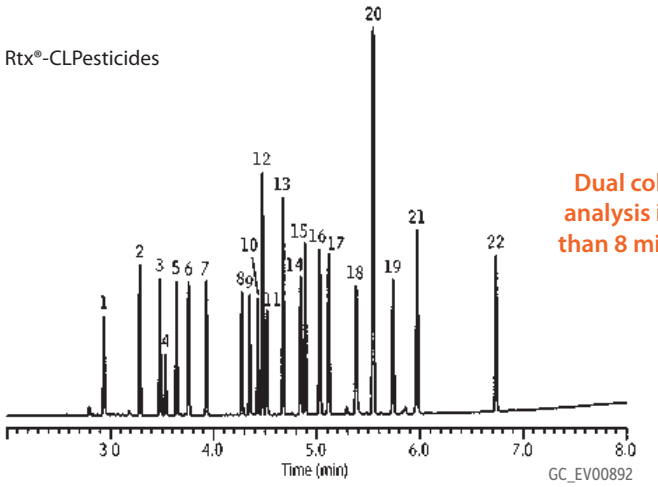
Detector ECD @ 330 °C

Notes This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

Peaks
1. 2,4,5,6-Tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide (isomer B)
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. 4,4'-DDT
18. Endrin aldehyde
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. decachlorobiphenyl (SS)

Organochlorine Pesticides on Rtx®-CLPesticides Columns (0.18 mm ID column set)

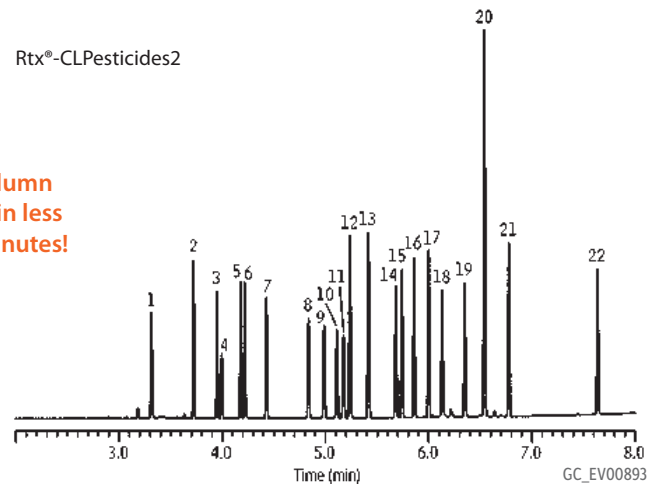
Rtx®-CLPesticides



GC_EV00892

Dual column analysis in less than 8 minutes!

Rtx®-CLPesticides2



GC_EV00893

Columns Rtx®-CLPesticides 20 m, 0.18 mm ID, 0.18 µm (cat.# 42102)
and Rtx®-CLPesticides2 20 m, 0.18 mm ID, 0.14 µm (cat.# 42302)
using IP deactivated guard column 5 m, 0.53 mm ID (cat.# 10045)
with SeCure® "Y" connector kit with universal "Y" Press-Tight® connector (cat.# 20276)

Sample Organochlorine pesticide mix AB #2 (cat.# 32292)
Pesticide surrogate mix, EPA 8080, 8081 (cat.# 32000)

Injection
Inj. Vol.: 0.5 µL splitless (hold 0.75 min)
Liner: Splitless taper (2 mm) (cat.# 20796)
Inj. Temp.: 250 °C

Oven
Oven Temp: 140 °C (hold 1 min) to 250 °C at 35 °C/min (hold 1 min) to 330 °C at 35 °C/min (hold 3 min)

Carrier Gas He, constant linear velocity
Linear Velocity: 20 cm/sec @ 140 °C

Detector µ-ECD @ 350 °C

Instrument Agilent/HP6890 GC

Notes cat.# 32292 = 8-80 µg/mL each component in hexane/toluene
cat.# 32000 = 200 µg/mL each component in acetone

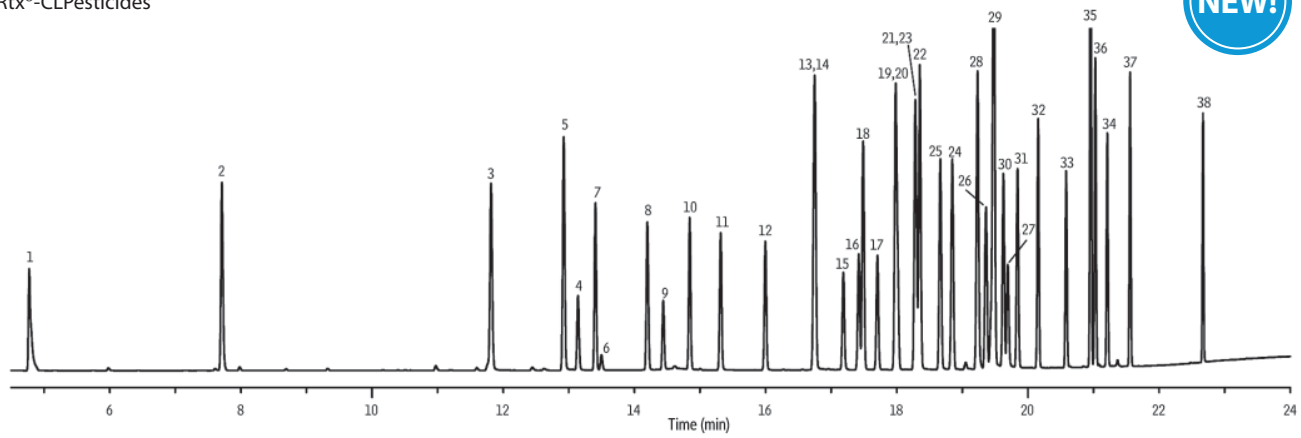
Peaks
1. 2,4,5,6-Tetrachloro-*m*-xylene (SS)
2. α-BHC
3. γ-BHC
4. β-BHC
5. δ-BHC
6. Heptachlor
7. Aldrin
8. Heptachlor epoxide
9. γ-Chlordane
10. α-Chlordane
11. Endosulfan I
12. 4,4'-DDE
13. Dieldrin
14. Endrin
15. 4,4'-DDD
16. Endosulfan II
17. 4,4'-DDT
18. Endrin aldehyde
19. Endosulfan sulfate
20. Methoxychlor
21. Endrin ketone
22. Decachlorobiphenyl (SS)

This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

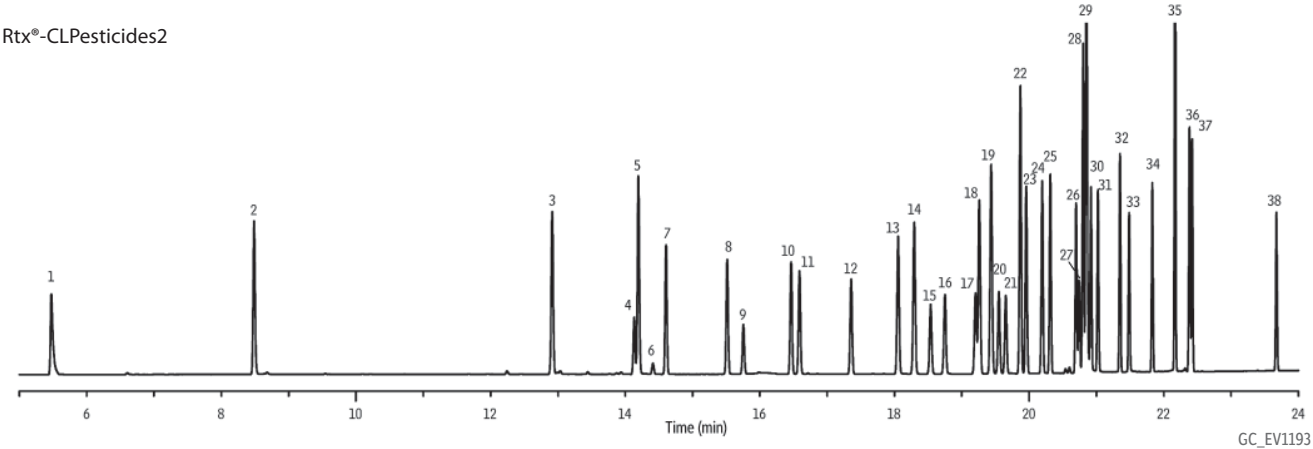
Organochlorine Pesticides by EPA Method 8081B on Rtx®-CLPesticides/Rtx®-CLPesticides2 (extended list)

NEW!

Rtx®-CLPesticides



Rtx®-CLPesticides2



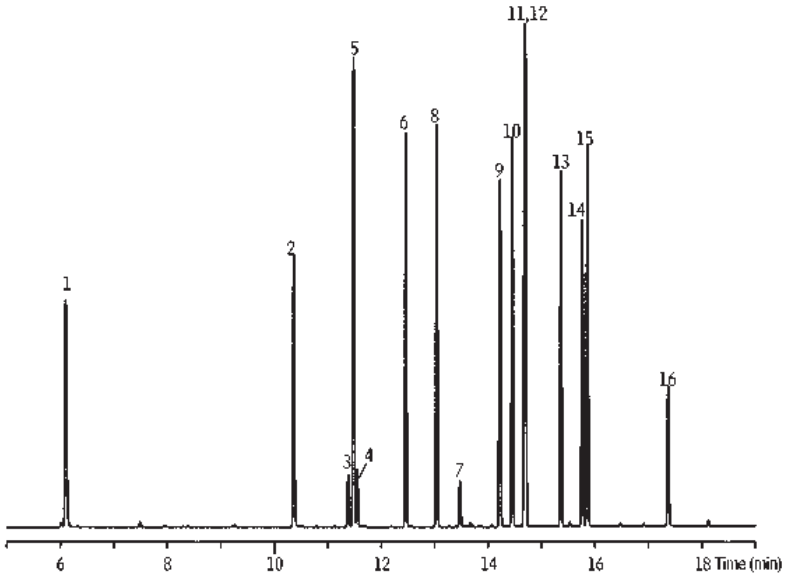
GC_EV1193

Columns	Rtx®-CLPesticides2 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324) and Rtx®-CLPesticides 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141) using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039) with deactivated universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample	Organochlorine pesticide mix AB #2 (cat.# 32292) Organochlorine pesticide mix C #1 (cat.# 32296) 2,4,5,6-Tetrachloro-*m*-xylene (cat.# 32027) Decachlorobiphenyl (BZ #209) (cat.# 32029) Chlorpyrifos (cat.# 32212) 2,4'-DDE (cat.# 32099) 2,4'-DDD (cat.# 32098) Chlorobenzilate (cat.# 32211) Captan (cat.# custom) *cis*-Nonachlor (cat.# custom) Mirex (cat.# custom) Oxychlordone (cat.# custom) Diallate (cat.# custom)
Diluent:	Hexane
Injection	
Inj. Vol.:	1 µL splitless (hold 0.3 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20896)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	80 °C to 175 °C at 8 °C/min to 195 °C at 11 °C/min to 235 °C at 7 °C/min to 320 °C at 25 °C/min (hold 3 min)
Carrier Gas	He, constant flow
Linear Velocity:	28 cm/sec
Detector	µ-ECD @ 330 °C
Make-up Gas Flow Rate:	60 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

	Peaks	Conc. (ng/mL)
1.	1,2-Dibromo-3-chloropropane	100
2.	Hexachlorocyclopentadiene	100
3.	Tetrachloro-*m*-xylene (SS)	100
4.	*cis*-Diallate	500
5.	Hexachlorobenzene	100
6.	*trans*-Diallate	500
7.	α-BHC	40
8.	γ-BHC	40
9.	β-BHC	40
10.	δ-BHC	40
11.	Heptachlor	40
12.	Aldrin	40
13.	Chlorpyrifos	100
14.	Isodrin	100
15.	Oxychlordane	50
16.	Heptachlor epoxide	40
17.	γ-Chlordane	40
18.	2,4'-DDE	100
19.	*trans*-Nonachlor	100
20.	α-Chlordane	40
21.	Endosulfan I	40
22.	Captan	100
23.	4,4'-DDE	100
24.	Dieldrin	80
25.	2,4'-DDD	100
26.	Endrin	80
27.	Chlorobenzilate	500
28.	2,4'-DDT	100
29.	*cis*-Nonachlor	100
30.	4,4'-DDD	80
31.	Endosulfan II	80
32.	4,4'-DDT	80
33.	Endrin aldehyde	80
34.	Endosulfan sulfate	80
35.	Methoxychlor	400
36.	Mirex	100
37.	Endrin ketone	80
38.	Decachlorobiphenyl	100

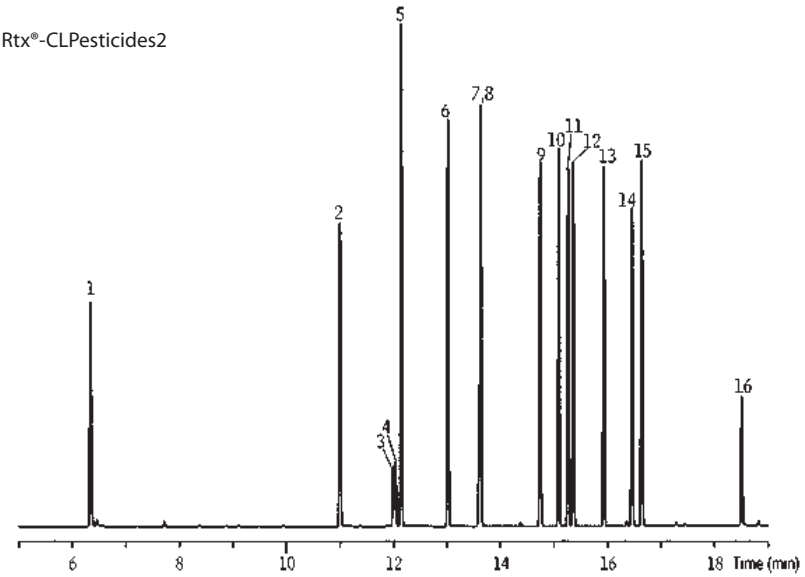
Pesticides of U.S. EPA Method 505 on Rtx®-CLPesticides and Rtx®-CLPesticides2

Rtx®-CLPesticides



GC_EV01004

Rtx®-CLPesticides2



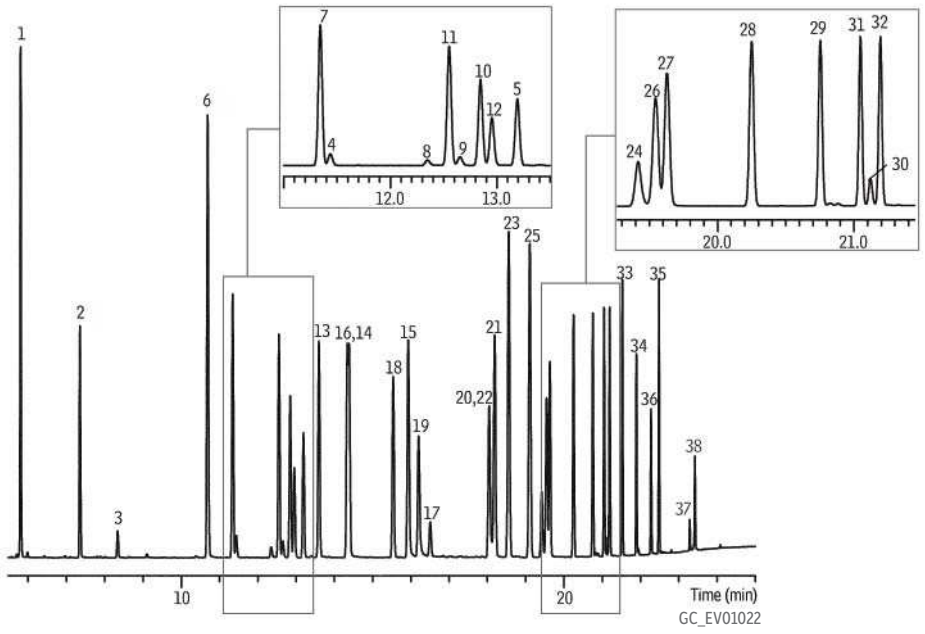
GC_EV01005

Peaks
1. Hexachlorocyclopentadiene
2. Hexachlorobenzene
3. Simazine
4. Atrazine
5. γ-BHC
6. Heptachlor
7. Alachlor
8. Aldrin
9. Heptachlor epoxide
10. γ-Chlordane
11. *trans*-Nonachlor
12. α-Chlordane
13. Dieldrin
14. Endrin
15. *cis*-Nonachlor
16. Methoxychlor

Columns	Rtx®-CLPesticides 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141) and Rtx®-CLPesticides2 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324) using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039) with deactivated universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample	200 ng/mL 505 organohalide pesticide mix (cat.# 32024) 4.2 µg/mL simazine (cat.# 32236) 4.2 µg/mL atrazine (cat.# 32208)
Diluent:	Methanol
Injection	
Inj. Vol.:	2 µL splitless (hold 0.75 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20896)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	90 °C (hold 1 min) to 310 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Linear Velocity:	40 cm/sec
Detector	µ-ECD @ 325 °C
Instrument	Agilent/HP6890 GC
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

Pesticides & Herbicides US EPA Method 508.1 on Rtx®-CLPesticides & Rtx®-CLPesticides2

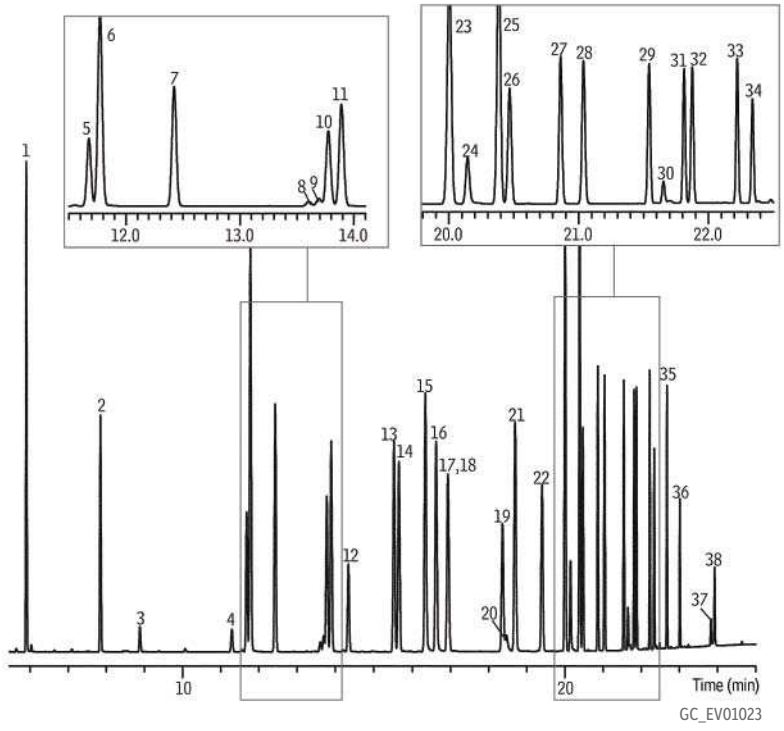
Rtx®-CLPesticides



Peaks

1. Hexachlorocyclopentadiene
2. Etridiazole
3. Chlorneb
4. Propachlor
5. Trifluralin
6. Hexachlorobenzene
7. α-BHC
8. Simazine
9. Atrazine
10. Pentachloronitrobenzene (IS)
11. γ-BHC
12. β-BHC
13. δ-BHC
14. Heptachlor
15. Chlorothalonil
16. Metribuzin
17. Alachlor
18. Aldrin
19. 4,4'-Dibromobiphenyl (SS)
20. Metachlor
21. DCPA
22. Heptachlor epoxide
23. γ-Chlordane
24. Cyanazine
25. α-Chlordane
26. Endosulfan I
27. 4,4'-DDE
28. Dieldrin
29. Endrin
30. Chlorobenzilate
31. 4,4'-DDD
32. Endosulfan II
33. 4,4'-DDT
34. Endrin aldehyde
35. Endosulfan sulfate
36. Methoxychlor
37. *cis*-Permethrin
38. *trans*-Permethrin

Rtx®-CLPesticides2

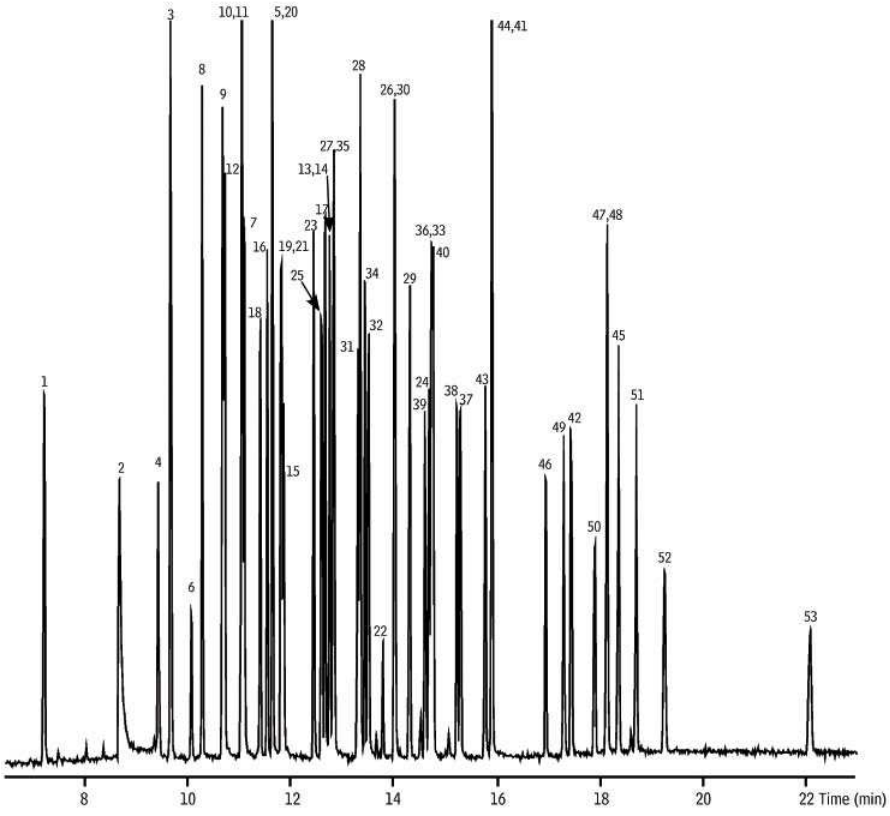


Columns	Rtx®-CLPesticides2 30 m, 0.32 mm ID, 0.25 µm (cat.# 11324) and Rtx®-CLPesticides 30 m, 0.32 mm ID, 0.32 µm (cat.# 11141) using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039) with deactivated universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample	50 ng/mL 508.1 calibration mix #1 (cat.# 32094) 100 ng/mL 508.1 calibration mix #2 (cat.# 32095) 100 ng/mL 508.1 calibration mix #3 (cat.# 32096) 50 ng/mL pentachloronitrobenzene (cat.# 32091) 250 ng/mL 4,4'-dibromobiphenyl (cat.# 32092) 500 ng/mL atrazine (cat.# 32208) 500 ng/mL simazine (cat.# 32236)
Diluent:	Ethyl acetate
Injection	
Inj. Vol.:	2 µL splitless (hold 0.75 min)
Liner:	Cyclo double taper (4 mm) (cat.# 20896)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	80 °C (hold 0.5 min) to 155 °C at 19 °C/min (hold 1 min) to 210 °C at 4 °C/min to 310 °C at 25 °C/min (hold 0.5 min)
Carrier Gas	He, constant flow
Linear Velocity:	26 cm/sec
Detector	µ-ECD @ 325 °C
Notes	This chromatogram was obtained using an Agilent µ-ECD. To obtain comparable results, you will need to employ a µ-ECD in addition to confirmational dual columns connected to a 5-meter guard column using a "Y" Press-Tight® connector.

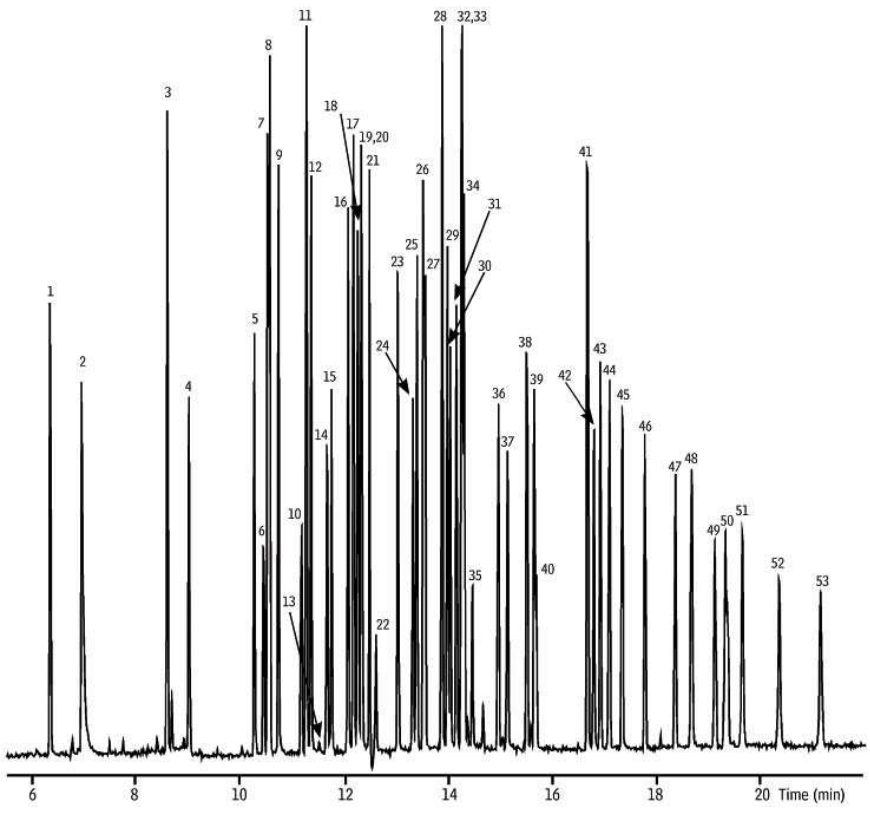
For specifications and a competitive column comparison, go to **www.restek.com/RtxCLP7**

Organophosphorous Pesticides U.S. EPA Method 8141A on Rtx®-OPPesticides & Rtx®-OPPesticides2

Rtx®-OPPesticides



Rtx®-OPPesticides2



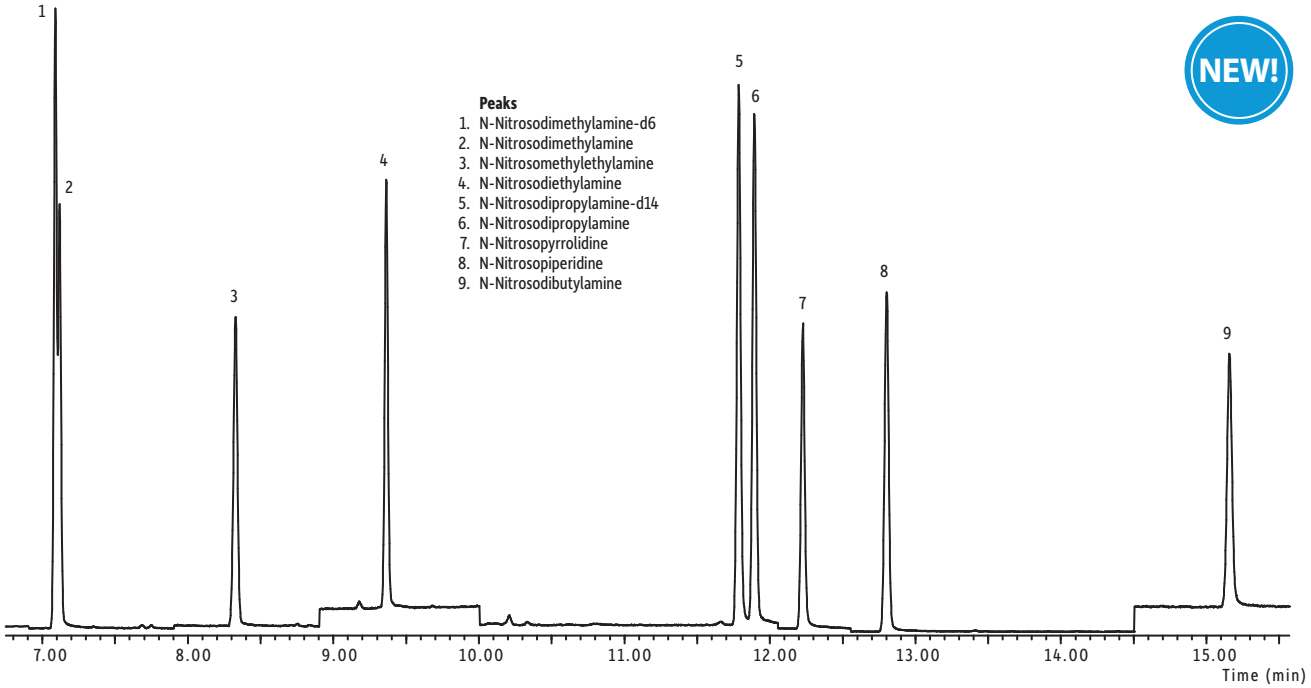
GC_EV00394

Peaks

1. Dichlorvos
2. Hexamethylphosphoramide
3. Mevinphos
4. Trichlorfon
5. TEPP
6. Demeton-O
7. Tributyl phosphate (SS)
8. Thionazin
9. Ethoprop
10. Naled
11. Sulfotepp
12. Phorate
13. Dicrotophos
14. Monocrotophos
15. Demeton-S
16. Terbufos
17. Dimethoate
18. Diazinon
19. Dioxathion
20. Fonophos
21. Disulfoton
22. Phosphamidon isomer (breakdown product)
23. Dichlorofenthion
24. Phosphamidon
25. Chlorpyrifos methyl
26. Methyl parathion
27. Ronnel
28. Aspon
29. Fenitrothion
30. Malathion
31. Chlorpyrifos
32. Trichloronate
33. Parathion-ethyl
34. Fenthion
35. Merphos
36. Chlorfenvinphos
37. Crotoxyphos
38. Stirofos
39. Tokuthion
40. Merphos oxone (breakdown product)
41. Ethion
42. Fensulfothion
43. Bolstar
44. Carbophenothion
45. Famphur
46. Triphenyl phosphate (SS)
47. EPN
48. Phosmet
49. Leptophos
50. Tri-*o*-cresyl phosphate
51. Azinphos-methyl
52. Azinphos-ethyl
53. Coumaphos

Columns	Rtx®-OPPesticides 30 m, 0.32 mm ID, 0.50 µm (cat.# 11239) and Rtx®-OPPesticides2 30 m, 0.32 mm ID, 0.32 µm (cat.# 11241)
Sample	Triphenylphosphate (cat.# 32281) Tributylphosphate (cat.# 32280) 8140/8141 OP pesticide calibration mix A (cat.# 32277) 8141 OP pesticide calibration mix B (cat.# 32278)
Conc.:	100 ng/mL
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Siltek® splitless taper (4 mm) (cat.# 20798-214.1)
Inj. Temp.:	200 °C
Oven	
Oven Temp:	80 °C (hold 0.5 min) to 280 °C at 12 °C/min (hold 10 min)
Carrier Gas	He
Dead Time:	1.03 min @ 80 °C
Detector	FPD @ 250 °C
Notes	Constant pressure

Nitrosamines in Drinking Water on Rxi®-624Sil MS by Modified EPA Method 521 Utilizing CSR-LVSI



GC_EV1286

Column	Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868) using Rxi® guard column 5 m, 0.25 mm ID (cat.# 10029) with universal Press-Tight® connectors (cat.# 20429)
Sample	N-Nitrosodimethylamine-d6 (cat.# 33910) N-Nitrosodi-*n*-propylamine-d14 (cat.# 33911) Nitrosamine calibration mix, method 521 (cat.# 31898)
Diluent:	Dichloromethane
Conc.:	10 ng/mL
Injection	
Inj. Vol.:	10 µL splitless (hold 1 min)
Liner:	Sky® 4 mm single taper w/wool (cat.# 23303.5)
Inj. Temp.:	250 °C
Purge Flow:	80 mL/min
Oven	
Oven Temp:	38 °C (hold 1 min) to 160 °C at 12 °C/min to 200 °C at 5 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.4 mL/min
Detector	Agilent 5975C
SIM Program:	**Start Time**

Group	(min)	Ion(s) (m/z)	Dwell (ms)
1	6.9	80, 74, 46, 43, 42	23
2	7.9	88, 56, 43, 42	30
3	8.9	102, 56, 44, 42	30
4	10	130, 78, 70, 58, 46, 43, 42	15
5	12.05	100, 68, 42, 41	30
6	14.5	158, 116, 84, 57, 41	23

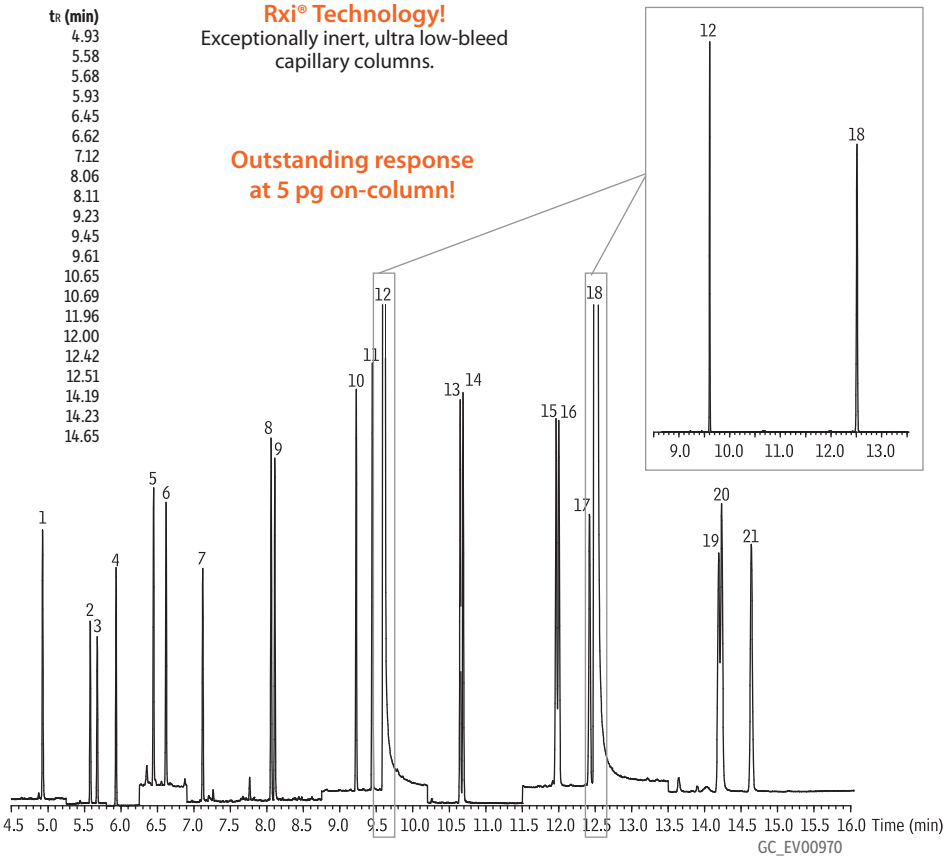
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	230 °C
Quad Temp.:	150 °C
Solvent Delay Time:	6.9 min
Tune Type:	BFB
Ionization Mode:	EI
Instrument	Agilent 7890A GC & 5975C MSD

Polycyclic Aromatic Hydrocarbons on Rxi®-5Sil MS

	Peaks	t_R (min)
1.	Naphthalene	4.93
2.	2-Methylnaphthalene	5.58
3.	1-Methylnaphthalene	5.68
4.	2-Fluorobiphenyl (SS)	5.93
5.	Acenaphthylene	6.45
6.	Acenaphthene	6.62
7.	Fluorene	7.12
8.	Phenanthrene	8.06
9.	Anthracene	8.11
10.	Fluoranthene	9.23
11.	Pyrene	9.45
12.	*p*-Terphenyl-d14 (IS)	9.61
13.	Benzo[a]anthracene	10.65
14.	Chrysene	10.69
15.	Benzo[b]fluoranthene	11.96
16.	Benzo[k]fluoranthene	12.00
17.	Benzo[a]pyrene	12.42
18.	Perylene-d12 (IS)	12.51
19.	Indeno[1,2,3-cd]pyrene	14.19
20.	Dibenzo[a,h]anthracene	14.23
21.	Benzo[ghi]perylene	14.65

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

Outstanding response at 5 pg on-column!



Column Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample PAH mix, 1 µL of 0.005 µg/mL (IS 2 µg/mL)
SV Calibration mix #5 / 610 PAH Mix (cat.# 31011)
1-Methylnaphthalene (cat.# 31283)
2-Methylnaphthalene (cat.# 31285)
2-Fluorobiphenyl (cat.# 31091)
Conc.: 5 pg on-column
Injection
Inj. Vol.: 1.0 µL pulsed splitless (hold 0.15 min)
Liner: Drilled Uniliner® (hole near top) w/wool (cat.# 21055-200.5)
Inj. Temp.: 300 °C
Pulse Pressure: 20 psi (137.9 kPa)
Pulse Time: 0.2 min
Purge Flow: 60 mL/min
Oven
Oven Temp: 50 °C (hold 0.5 min) to 290 °C at 25 °C/min to 320 °C at 5 °C/min
Carrier Gas He, constant flow
Flow Rate: 1.4 mL/min
Detector MS
Mode: SIM
SIM Program:

Group	Start Time (min)	Ion(s)	Dwell (ms)
1		128 m/z	100
2		142 m/z	100
3		172 m/z	100
4		152 m/z	100
5		166 m/z	100
6		178 m/z	100
7		202,244 m/z	100
8		228 m/z	100
9		252,264 m/z	100
10		276,278 m/z	100

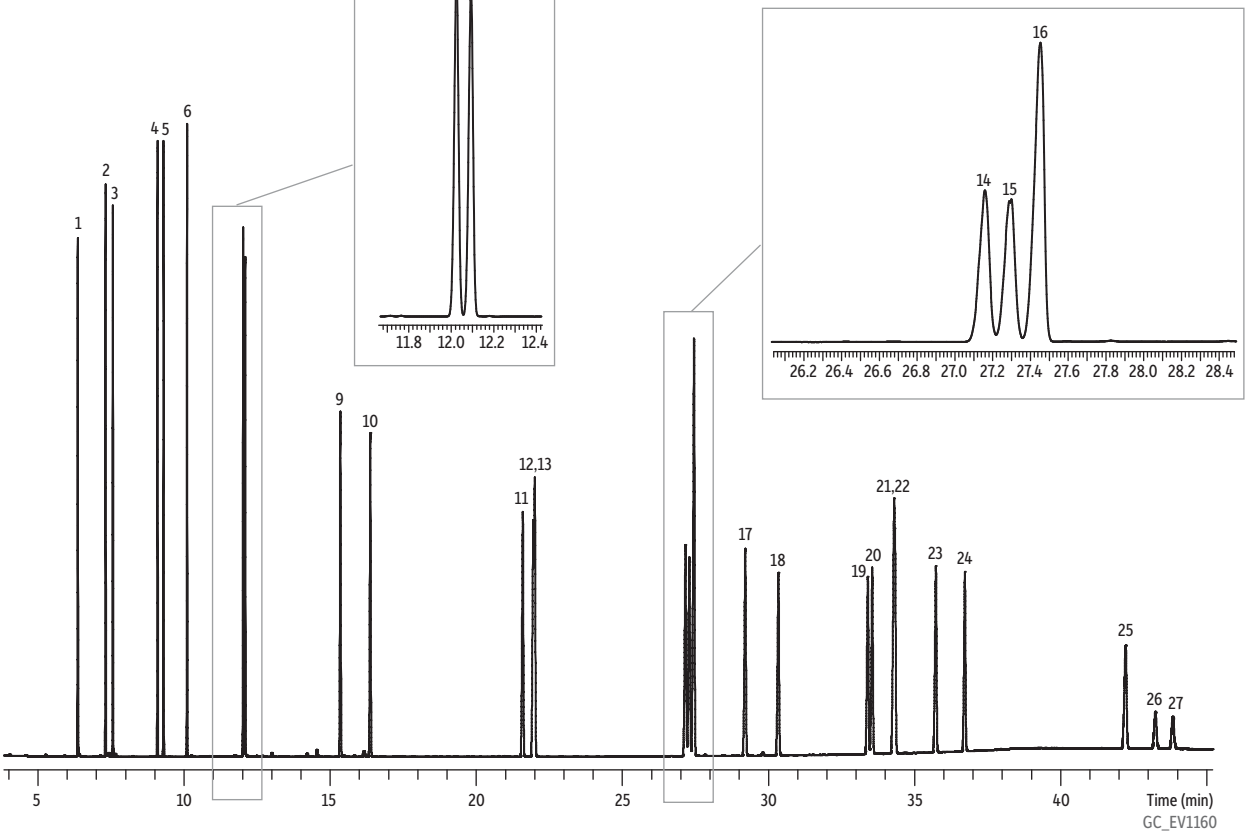
Transfer Line Temp.: 290 °C
Ionization Mode: EI

Polycyclic Aromatic Hydrocarbons on Rxi®-17Sil MS

Peaks
1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benz[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fluoranthene
15. Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. 3-Methylcholanthrene
19. Dibenz[a,h]acridine
20. Dibenz[a,j]acridine
21. Indeno[1,2,3-cd]pyrene
22. Dibenz[a,h]anthracene
23. Benzo[ghi]perylene
24. 7H-Dibenzo[c,g]carbazole
25. Dibenzo[a,e]pyrene
26. Dibenzo[a,i]pyrene
27. Dibenzo[a,h]pyrene

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

Excellent resolution and peak shape for PAHs that cannot be resolved by MS.



Column	Rxi®-17Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123)
Sample	PAH supplement mix for method 8100 (cat.# 31857) EPA Method 8310 PAH mixture (cat.# 31841) triphenylene (custom)
Diluent:	Dichloromethane
Conc.:	10 ppm
Injection	
Inj. Vol.:	0.5 µL splitless (hold 1.75 min)
Liner:	Auto SYS XL PSS split/splitless w/wool (cat.# 21718)
Inj. Temp.:	320 °C
Purge Flow:	75 mL/min
Oven	
Oven Temp:	65 °C (hold 0.5 min) to 220 °C at 15 °C/min to 330 °C at 4 °C/min (hold 15 min)
Carrier Gas	He, constant flow
Flow Rate:	2.0 mL/min
Detector	FID @ 320 °C
Instrument	PE Clarus 600 GC
Acknowledgement	
	Instrument provided by PerkinElmer

Polycyclic Aromatic Hydrocarbons on Rxi®-17Sil MS (15 m x 0.25 mm x 0.25 µm)

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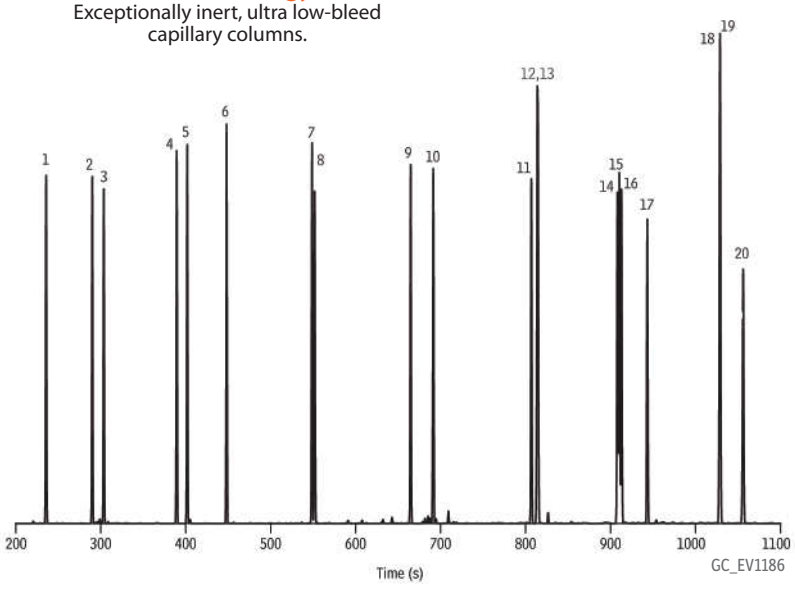
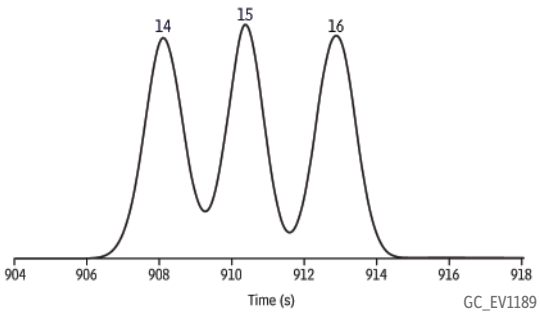
Exceptionally inert, ultra low-bleed capillary columns.



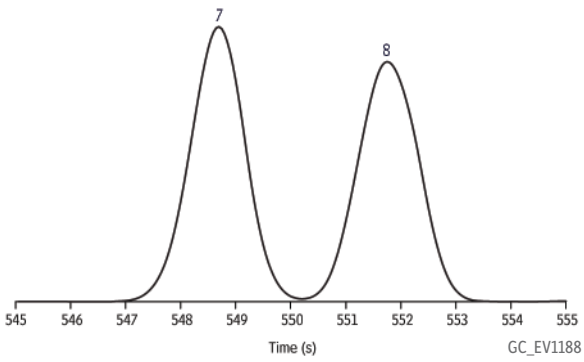
Peaks
1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fluoranthene
15 Benzo[k]fluoranthene
16. Benzo[j]fluoranthene
17. Benzo[a]pyrene
18. Indeno[1,2,3-cd]pyrene
19. Dibenz[a,h]anthracene
20. Benzo[ghi]perylene

Benzofluoranthenes on Rxi®-17Sil MS (15 m x 0.25 mm x 0.25 µm)



Column	Rxi®-17Sil MS, 15 m, 0.25 mm ID, 0.25 µm (cat.# 14120)
Sample	
Diluent:	Methylene chloride
Conc.:	20 ng/µL
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Liner:	4 mm split Precision® liner w/wool (cat.# 21022)
Inj. Temp.:	275 °C
Split Vent Flow Rate:	42 mL/min
Oven	
Oven Temp:	80 °C (hold 1 min) to 320 °C at 15 °C/min (hold 2 min)
Carrier Gas	H_2, constant flow
Flow Rate:	2 mL/min
Detector	FID @ 340 °C
Constant Column + Constant Make-up:	50 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC

Phenanthrene and Anthracene on Rxi®-17Sil MS (15 m x 0.25 mm x 0.25 µm)



EPA 522 Analyte Mix on Rxi®-624Sil MS (30 m x 0.25 mm x 1.4 µm)

NEW!

Peaks	t_R (min)
1. Tetrahydrofuran-D8	5.27
2. 1,4-Dioxane-d8	6.19
3. 1,4-Dioxane	6.23

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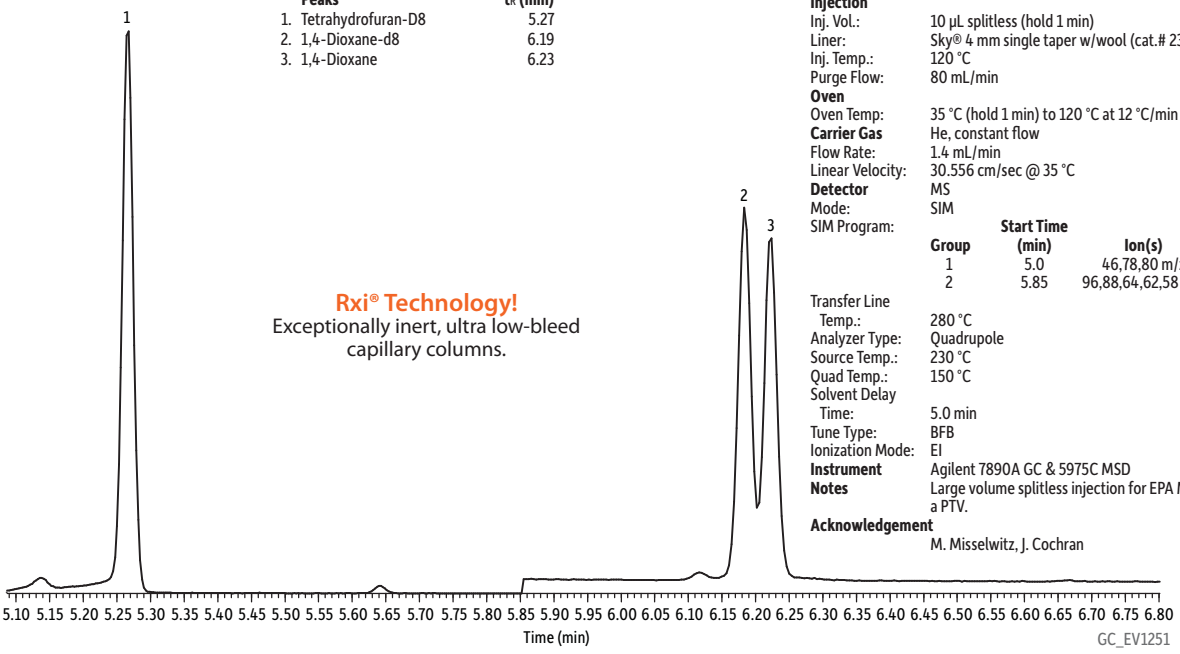


GC_EV1251

Column Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868) using Rxi® guard column 5 m, 0.25 mm ID (cat.# 10029) with universal angled Press-Tight® connectors (cat.# 20446-261)
Sample Tetrahydrofuran-d8 (cat.# 30112), 1,4-Dioxane-d8 (cat.# 30614), 1,4-Dioxane (cat.# 30287)
Diluent: Dichloromethane
Conc.: 50 ng/mL
Injection
Inj. Vol.: 10 µL splitless (hold 1 min)
Liner: Sky® 4 mm single taper w/wool (cat.# 23303.5)
Inj. Temp.: 120 °C
Purge Flow: 80 mL/min
Oven
Oven Temp: 35 °C (hold 1 min) to 120 °C at 12 °C/min (hold 1 min)
Carrier Gas
Flow Rate: 1.4 mL/min
Linear Velocity: 30.556 cm/sec @ 35 °C
Detector MS
Mode: SIM
SIM Program:

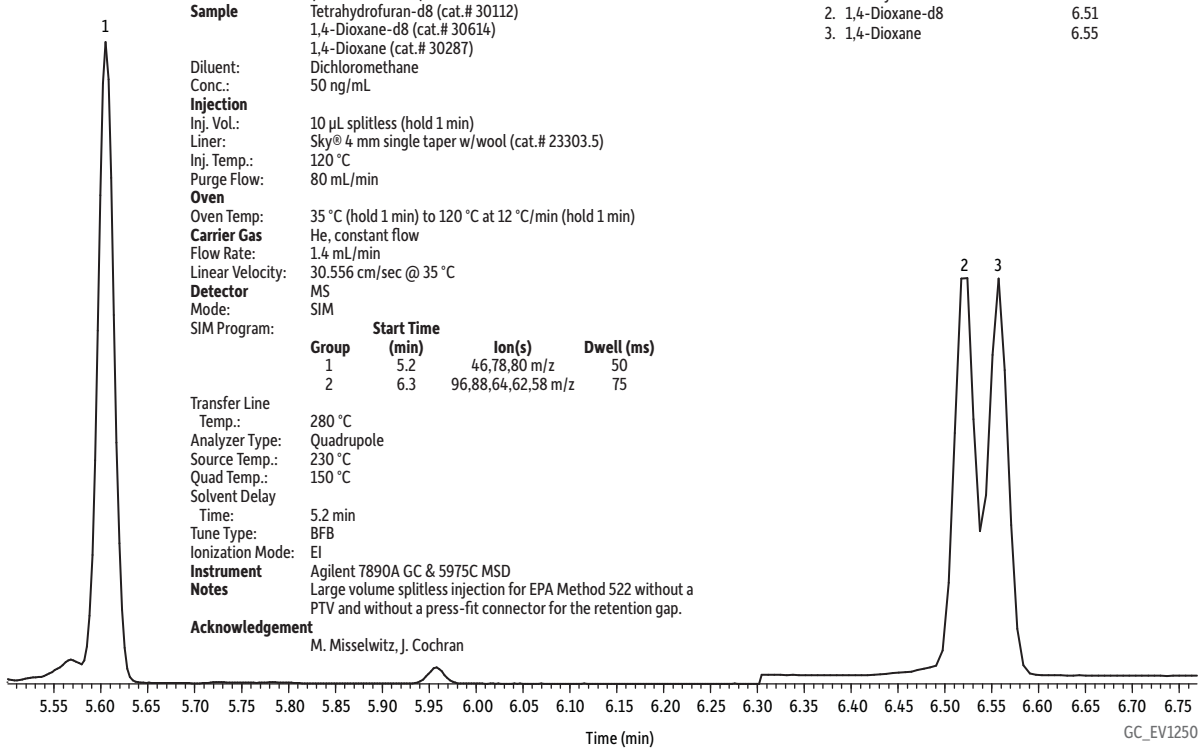
Group	Start Time (min)	Ion(s)	Dwell (ms)
1	5.0	46,78,80 m/z	50
2	5.85	96,88,64,62,58 m/z	40

Transfer Line Temp.: 280 °C
Analyzer Type: Quadrupole
Source Temp.: 230 °C
Quad Temp.: 150 °C
Solvent Delay Time: 5.0 min
Tune Type: BFB
Ionization Mode: EI
Instrument Agilent 7890A GC & 5975C MSD
Notes Large volume splitless injection for EPA Method 522 without a PTV.
Acknowledgement M. Misselwitz, J. Cochran

EPA 522 Analyte Mix on Rtx®-624 w/5 m Integra-Guard® (30 m x 0.25 mm x 1.4 µm)

NEW!

Peaks	t_R (min)
1. Tetrahydrofuran-D8	5.59
2. 1,4-Dioxane-d8	6.51
3. 1,4-Dioxane	6.55



GC_EV1250

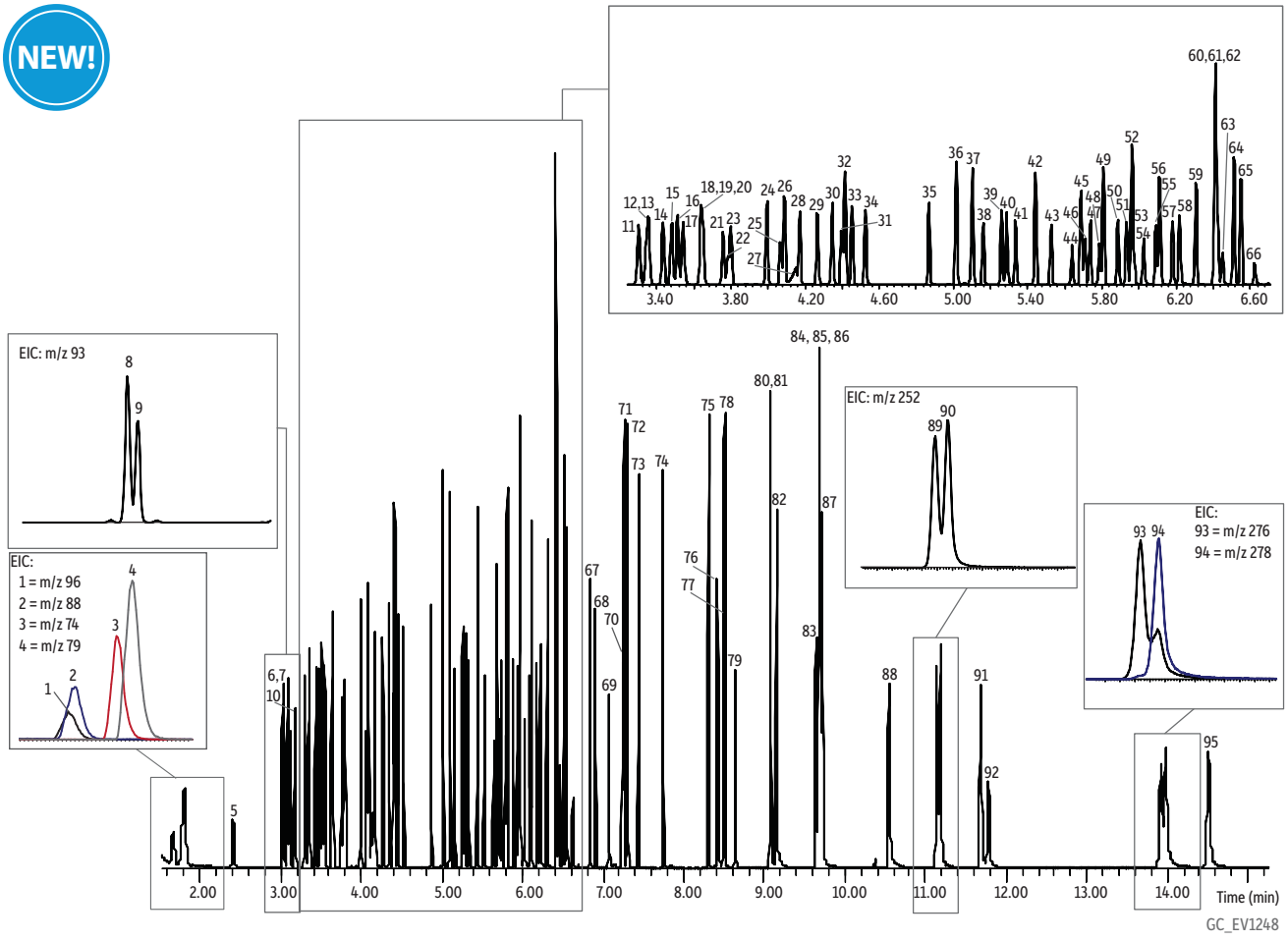
Column Rtx®-624 w/5 m Integra-Guard®, 30 m, 0.25 mm ID, 1.40 µm (cat.# 10968-124)
Sample Tetrahydrofuran-d8 (cat.# 30112), 1,4-Dioxane-d8 (cat.# 30614), 1,4-Dioxane (cat.# 30287)
Diluent: Dichloromethane
Conc.: 50 ng/mL
Injection
Inj. Vol.: 10 µL splitless (hold 1 min)
Liner: Sky® 4 mm single taper w/wool (cat.# 23303.5)
Inj. Temp.: 120 °C
Purge Flow: 80 mL/min
Oven
Oven Temp: 35 °C (hold 1 min) to 120 °C at 12 °C/min (hold 1 min)
Carrier Gas
Flow Rate: 1.4 mL/min
Linear Velocity: 30.556 cm/sec @ 35 °C
Detector MS
Mode: SIM
SIM Program:

Group	Start Time (min)	Ion(s)	Dwell (ms)
1	5.2	46,78,80 m/z	50
2	6.3	96,88,64,62,58 m/z	75

Transfer Line Temp.: 280 °C
Analyzer Type: Quadrupole
Source Temp.: 230 °C
Quad Temp.: 150 °C
Solvent Delay Time: 5.2 min
Tune Type: BFB
Ionization Mode: EI
Instrument Agilent 7890A GC & 5975C MSD
Notes Large volume splitless injection for EPA Method 522 without a PTV and without a press-fit connector for the retention gap.
Acknowledgement M. Misselwitz, J. Cochran

Semivolatiles on Rxi®-5Sil MS by EPA Method 8270 (Split Injection)

NEW!



GC_EV1248

Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	8270 MegaMix® (cat.# 31850) 8270 Benzidines mix (cat.# 31852) Benzoic acid (cat.# 31879) 1,4-Dioxane (cat.# 31853) Revised B/N surrogate mix (cat.# 31888) Acid surrogate mix (4/89 SOW) (cat.# 31063) Revised SV internal standard mix (cat.# 31886)
Diluent:	Methylene chloride
Conc.:	40 µg/mL (IS/SS 20 µg/mL)
Injection	
Inj. Vol.:	1 µL split (split ratio 10:1)
Liner:	Sky® 4 mm Precision® liner w/wool (cat.# 23305.5)
Inj. Temp.:	270 °C
Split Vent Flow Rate:	12 mL/min
Oven	
Oven Temp.:	70 °C (hold 1 min) to 285 °C at 28 °C/min to 305 °C at 3 °C/min to 320 °C at 30 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	270 °C
Quad Temp.:	150 °C
Electron Energy:	70 eV
Solvent Delay Time:	1.3 min
Tune Type:	DFTPP
Ionization Mode:	EI
Scan Range:	35-550 amu
Scan Rate:	5.36 scans/sec
Instrument	Agilent 7890A GC & 5975C MSD

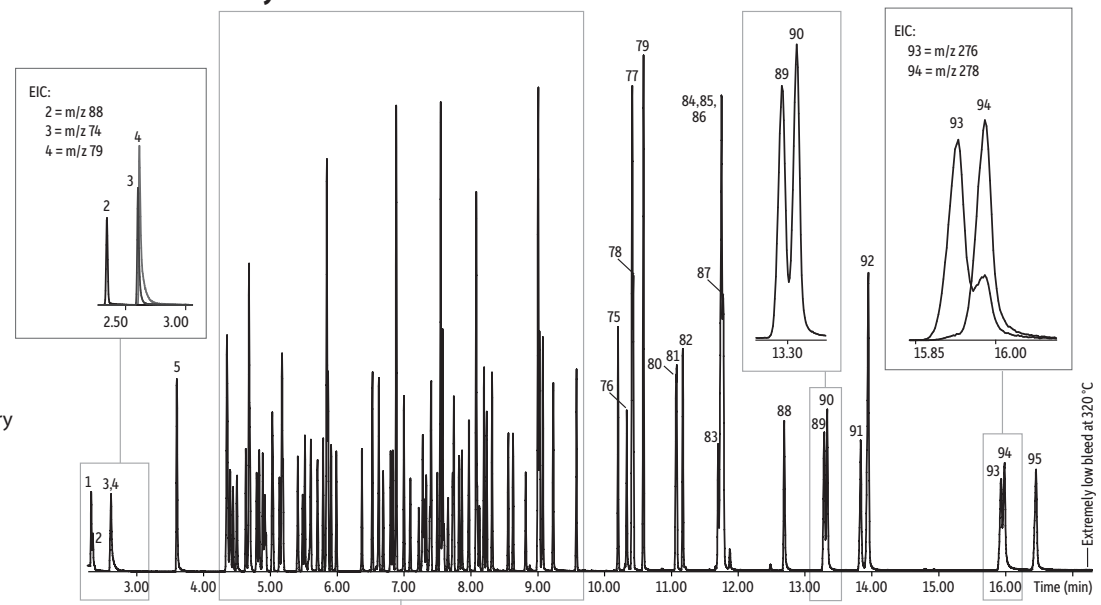
Peaks

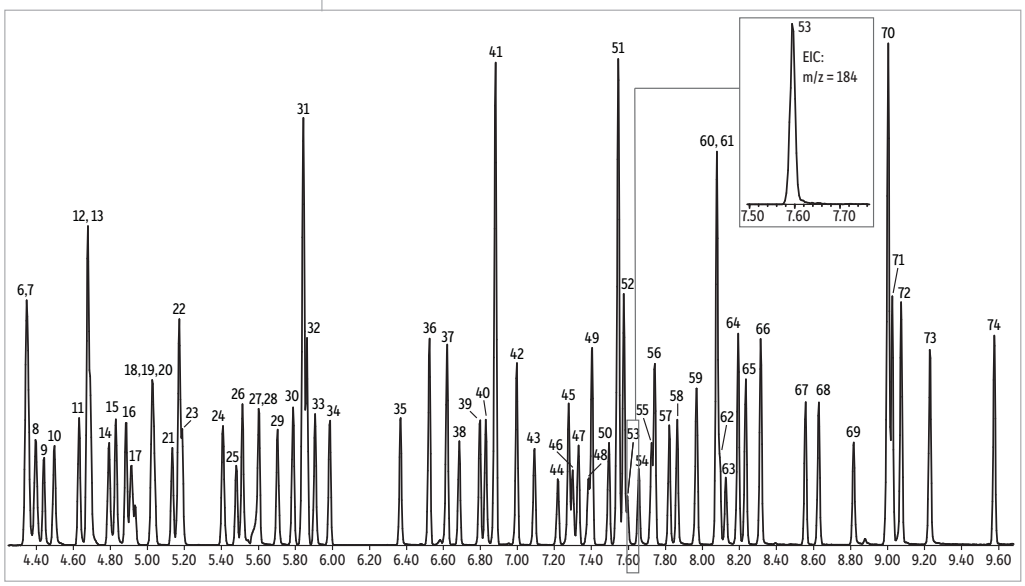
1. 1,4-Dioxane-d8 (IS)
2. 1,4-Dioxane
3. N-Nitrosodimethylamine
4. Pyridine
5. 2-Fluorophenol (SS)
6. Phenol-d6 (SS)
7. Phenol
8. Aniline
9. Bis(2-chloroethyl)ether
10. 2-Chlorophenol
11. 1,3-Dichlorobenzene
12. 1,4-Dichlorobenzene-D4 (IS)
13. 1,4-Dichlorobenzene
14. Benzyl alcohol
15. 1,2-Dichlorobenzene
16. 2-Methylphenol
17. Bis(2-chloroisopropyl)ether
18. 4-Methylphenol
19. 3-Methylphenol
20. N-nitroso-di-*n*-propylamine
21. Hexachloroethane
22. Nitrobenzene-D5 (SS)
23. Nitrobenzene
24. Isophorone
25. 2-Nitrophenol
26. 2,4-Dimethylphenol
27. Benzoic acid
28. Bis(2-chloroethoxy)methane
29. 2,4-Dichlorophenol
30. 1,2,4-Trichlorobenzene
31. Naphthalene-D8 (IS)
32. Naphthalene
33. 4-Chloroaniline
34. Hexachlorobutadiene
35. 4-Chloro-3-methylphenol
36. 2-Methylnaphthalene
37. 1-Methylnaphthalene
38. Hexachlorocyclopentadiene
39. 2,4,6-Trichlorophenol
40. 2,4,5-Trichlorophenol
41. 2-Fluorobiphenyl (SS)
42. 2-Chloronaphthalene
43. 2-Nitroaniline
44. 1,4-Dinitrobenzene
45. Dimethyl phthalate
46. 1,3-Dinitrobenzene
47. 2,6-Dinitrotoluene
48. 1,2-Dinitrobenzene
49. Acenaphthylene
50. 3-Nitroaniline
51. Acenaphthene-d10 (IS)
52. Acenaphthene
53. 2,4-Dinitrophenol
54. 4-Nitrophenol
55. 2,4-Dinitrotoluene
56. Dibenzofuran
57. 2,3,5,6-Tetrachlorophenol
58. 2,3,4,6-Tetrachlorophenol
59. Diethyl phthalate
60. 4-Chlorophenyl phenyl ether
61. Fluorene
62. 4-Nitroaniline
63. 4,6-Dinitro-2-methylphenol
64. N-nitrosodiphenylamine
65. 1,2-Diphenylhydrazine
66. 2,4,6-Tribromophenol (SS)
67. 4-Bromophenyl phenyl ether
68. Hexachlorobenzene
69. Pentachlorophenol
70. Phenanthrene-D10 (IS)
71. Phenanthrene
72. Anthracene
73. Carbazole
74. di-*n*-Butyl phthalate
75. Fluoranthene
76. Benzidine
77. Pyrene-D10 (SS)
78. Pyrene
79. *p*-Terphenyl-d14 (SS)
80. 3,3'-Dimethylbenzidine
81. Butyl benzyl phthalate
82. Bis(2-ethylhexyl)adipate
83. 3,3'-Dichlorobenzidine
84. Benzo[a]anthracene
85. Chrysene-D12 (IS)
86. Bis(2-ethylhexyl)phthalate
87. Chrysene
88. Di-*n*-octyl phthalate
89. Benzo[b]fluoranthene
90. Benzo[k]fluoranthene
91. Benzo[a]pyrene
92. Perylene-D12 (IS)
93. Indeno[1,2,3-cd]pyrene
94. Dibenz[a,h]anthracene
95. Benzo[ghi]perylene

Semivolatile Organics on Rxi®-5Sil MS by U.S. EPA Method 8270

NEW!

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.





GC_EV1245

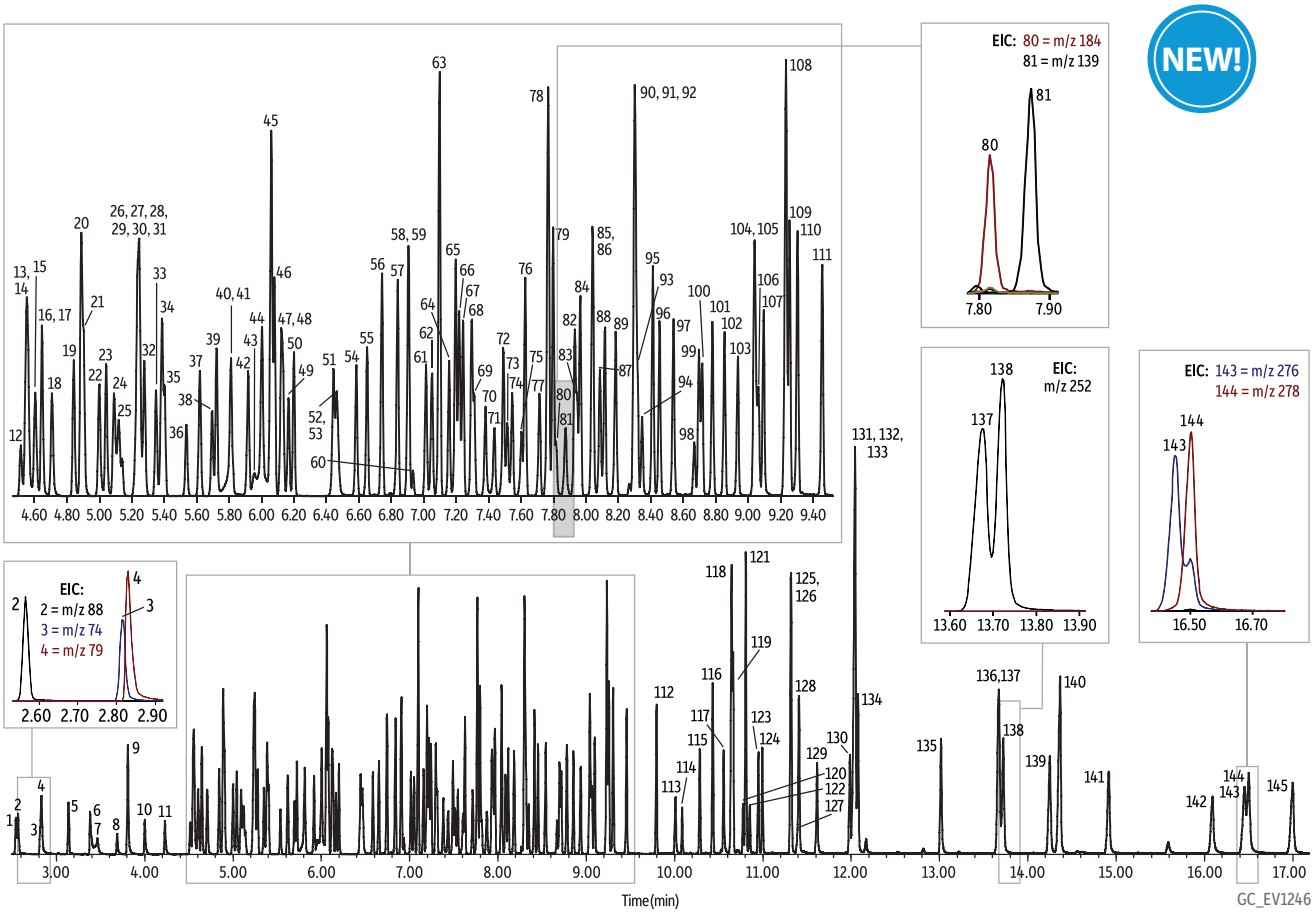
Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	8270 MegaMix® (cat.# 31850) 8270 Benzidines mix (cat.# 31852) Benzoic acid (cat.# 31879) 1,4-Dioxane (cat.# 31853) Revised B/N surrogate mix (cat.# 31888) Acid surrogate mix (4/89 SOW) (cat.# 31063) Revised SV internal standard mix (cat.# 31886)
Diluent:	Dichloromethane
Conc.:	8 µg/mL (IS/SS 20 µg/mL)
Injection	
Inj. Vol.:	1 µL pulsed splitless (hold 0.59 min)
Liner:	Sky® 4 mm single taper w/wool (cat.# 23303.5)
Inj. Temp.:	270 °C
Pulse Pressure:	30 psi (206.8kPa)
Pulse Time:	0.64 min
Purge Flow:	100 mL/min
Oven	
Oven Temp.:	40 °C (hold 1 min) to 280 °C at 25 °C/min to 320 °C at 5 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Linear Velocity:	39.723 cm/sec @ 40 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	276 °C
Quad Temp.:	150 °C
Solvent Delay Time:	2.19 min
Tune Type:	DFTPP
Ionization Mode:	EI
Scan Range:	35-550 amu
Scan Rate:	5.36 scans/sec
Instrument	Agilent 7890A GC & 5975C MSD
Notes	7890 Siltek®-treated EZ Twist Top split/splitless injection port (cat.# 22178) Gold-plated dual Vespel® ring inlet seal (cat.# 21241)

Peaks

1. 1,4-Dioxane-d8 (IS)
2. 1,4-Dioxane
3. N-Nitrosodimethylamine
4. Pyridine
5. 2-Fluorophenol (SS)
6. Phenol-d6 (SS)
7. Phenol
8. Aniline
9. Bis(2-chloroethyl) ether
10. 2-Chlorophenol
11. 1,3-Dichlorobenzene
12. 1,4-Dichlorobenzene-D4 (IS)
13. 1,4-Dichlorobenzene
14. Benzyl alcohol
15. 1,2-Dichlorobenzene
16. 2-Methylphenol
17. Bis(2-Chloroisopropyl)ether
18. 3-Methylphenol
19. 4-Methylphenol
20. N-Nitrosodi-N-propylamine
21. Hexachloroethane
22. Nitrobenzene-D5 (SS)
23. Nitrobenzene
24. Isophorone
25. 2-Nitrophenol
26. 2,4-Dimethylphenol
27. Bis(2-chloroethoxy)methane
28. Benzoic acid
29. 2,4-Dichlorophenol
30. 1,2,4-Trichlorobenzene
31. Naphthalene-D8 (IS)
32. Naphthalene
33. 4-Chloroaniline
34. Hexachlorobutadiene
35. 4-Chloro-3-methylphenol
36. 2-Methylnaphthalene
37. 1-Methylnaphthalene
38. Hexachlorocyclopentadiene
39. 2,4,6-Trichlorophenol
40. 2,4,5-Trichlorophenol
41. 2-Fluorobiphenyl (SS)
42. 2-Chloronaphthalene
43. 2-Nitroaniline
44. 1,4-Dinitrobenzene
45. Dimethyl phthalate
46. 1,3-Dinitrobenzene
47. 2,6-Dinitrotoluene
48. 1,2-Dinitrobenzene
49. Acenaphthylene
50. 3-Nitroaniline
51. Acenaphthene-d10 (IS)
52. Acenaphthene
53. 2,4-Dinitrophenol
54. 4-Nitrophenol
55. 2,4-Dinitrotoluene
56. Dibenzofuran
57. 2,3,5,6-Tetrachlorophenol
58. 2,3,4,6-Tetrachlorophenol
59. Diethyl phthalate
60. 4-Chlorophenyl phenyl ether
61. Fluorene
62. 4-Nitroaniline
63. 4,6-Dinitro-2-methylphenol
64. N-nitrosodiphenylamine (as diphenylamine)
65. 1,2-Diphenylhydrazine (as azobenzene)
66. 2,4,6-Tribromophenol (SS)
67. 4-Bromophenyl phenyl ether
68. Hexachlorobenzene
69. Pentachlorophenol
70. Phenanthrene-D10 (IS)
71. Phenanthrene
72. Anthracene
73. Carbazole
74. di-*n*-Butyl phthalate
75. Fluoranthene
76. Benzidine
77. Pyrene-d10 (SS)
78. Pyrene
79. *p*-Terphenyl-d14 (SS)
80. 3,3'-Dimethylbenzidine
81. Butyl benzyl phthalate
82. Bis(2-ethylhexyl) adipate
83. 3,3'-Dichlorobenzidine
84. Benzo[a]anthracene
85. Chrysene-D12 (IS)
86. Bis(2-ethylhexyl)phthalate
87. Chrysene
88. Di-*n*-octyl phthalate
89. Benzo[b]fluoranthene
90. Benzo[k]fluoranthene
91. Benzo[a]pyrene
92. Perylene-D12 (IS)
93. Indeno[1,2,3-cd]pyrene
94. Dibenz[a,h]anthracene
95. Benzo[ghi]perylene

Semivolatile Organics w/Appendix IX on Rxi®-5Sil MS by U.S. EPA Method 8270

NEW!



GC_EV1246

Column	Rxi®-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623)
Sample	8270 MegaMix® (cat.# 31850) 8270 Benzidines mix (cat.# 31852) Benzoic acid (cat.# 31879) Revised B/N surrogate mix (cat.# 31888) Acid surrogate mix (4/89 SOW) (cat.# 31063) Revised SV internal standard mix (cat.# 31886) Appendix IX mix #1 (cat.# 31625) Appendix IX mix #2 (cat.# 31806)
Diluent:	Dichloromethane
Conc.:	10 µg/mL (1,4-dioxane and IS/SS 20 µg/mL)
Injection	
Inj. Vol.:	1 µL pulsed splitless (hold 0.59 min)
Liner:	Sky® 4 mm single taper w/wool (cat.# 23303.5)
Inj. Temp.:	270 °C
Pulse Pressure:	30 psi (206.8kPa)
Pulse Time:	0.64 min
Purge Flow:	100 mL/min
Oven	
Oven Temp:	40 °C (hold 1 min) to 280 °C at 25 °C/min to 320 °C at 5 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.2 mL/min
Linear Velocity:	39.723 cm/sec @ 40 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Source Temp.:	276 °C
Quad Temp.:	150 °C
Solvent Delay Time:	2.19 min
Tune Type:	DFTPP
Ionization Mode:	EI
Scan Range:	35-550 amu
Scan Rate:	5.36 scans/sec
Instrument	Agilent 7890A GC & 5975C MSD
Notes	7890 Siltek®-treated EZ Twist Top® split/splitless injection port (cat.# 22178) Flip Seal® dual Vespel® ring inlet seal (cat.# 23411)

Peaks

1. 1,4-Dioxane-d8 (IS)
2. 1,4-Dioxane
3. N-Nitrosodimethylamine
4. Pyridine
5. Ethyl methacrylate
6. 2-Picoline
7. N-Nitrosomethylethylamine
8. Methyl methanesulfonate
9. 2-Fluorophenol (SS)
10. N-Nitrosodiethylamine
11. Ethyl methanesulfonate
12. Benzaldehyde
13. Phenol-d6 (SS)
14. Phenol
15. Aniline
16. Bis(2-chloroethyl) ether
17. Pentachloroethane
18. 2-Chlorophenol
19. 1,3-Dichlorobenzene
20. 1,4-Dichlorobenzene-D4 (IS)
21. 1,4-Dichlorobenzene
22. Benzyl alcohol
23. 1,2-Dichlorobenzene
24. 2-Methylphenol
25. Bis(2-Chloroisopropyl)ether
26. N-Nitrosopyrrolidine
27. 3-Methylphenol
28. 4-Methylphenol
29. Acetophenone
30. N-Nitrosodipropylamine
31. 4-Nitrosomorpholine
32. *o*-Toluidine
33. Hexachloroethane
34. Nitrobenzene-D5 (SS)
35. Nitrobenzene
36. N-Nitrosopiperidine
37. Isophorone
38. 2-Nitrophenol
39. 2,4-Dimethylphenol
40. Bis(2-chloroethoxy)methane
41. Benzoic acid
42. 2,4-Dichlorophenol
43. α,α-Dimethylphenethylamine
44. 1,2,4-Trichlorobenzene
45. Naphthalene-D8 (IS)
46. Naphthalene
47. 4-Chloroaniline
48. 2,6-Dichlorophenol
49. Hexachloropropene
50. Hexachlorobutadiene
51. N-Nitrosobutylamine
52. Caprolactam
53. 1,4-Phenylenediamine
54. 4-Chloro-3-methylphenol
55. Isosafrole (isomer)
56. 2-Methylnaphthalene
57. 1-Methylnaphthalene
58. Hexachlorocyclopentadiene
59. 1,2,4,5-Tetrachlorobenzene
60. Isosafrole (isomer)
61. 2,4,6-Trichlorophenol
62. 2,4,5-Trichlorophenol
63. 2-Fluorobiphenyl (SS)
64. Safrole
65. Biphenyl
66. 2-Chloronaphthalene
67. 1-Chloronaphthalene
68. Diphenyl ether
69. 2-Nitroaniline
70. 1,4-Naphthoquinone
71. 1,4-Dinitrobenzene
72. Dimethyl phthalate
73. 1,3-Dinitrobenzene
74. 2,6-Dinitrotoluene
75. 1,2-Dinitrobenzene
76. Acenaphthylene
77. 3-Nitroaniline
78. Acenaphthene-d10 (IS)
79. Acenaphthene
80. 2,4-Dinitrophenol
81. 4-Nitrophenol
82. Pentachlorobenzene
83. 2,4-Dinitrotoluene
84. Dibenzofuran
85. 1-Naphthalamine
86. 2,3,5,6-Tetrachlorophenol
87. 2,3,4,6-Tetrachlorophenol
88. 2-Naphthalamine
89. Diethyl phthalate
90. 4-Chlorophenyl phenyl ether
91. Fluorene
92. 2-Methyl-5-nitroaniline
93. 4-Nitroaniline
94. 4,6-Dinitro-2-methylphenol
95. N-nitrosodiphenylamine (as diphenylamine)
96. 1,2-Diphenylhydrazine (as azobenzene)
97. 2,4,6-Tribromophenol (SS)
98. 1,3,5-Trinitrobenzene
99. Diallate
100. Phenacetin
101. 4-Bromophenyl phenyl ether
102. Hexachlorobenzene
103. Atrazine
104. 4-Aminobiphenyl
105. Pentachlorophenol
106. Pentachloronitrobenzene
107. Propyzamide
108. Phenanthrene-D10 (IS)
109. Phenanthrene
110. Anthracene
111. Carbazole
112. di-*n*-Butyl phthalate
113. 4-Nitroquinoline 1-oxide
114. Methapyriline
115. Isodrin
116. Fluoranthene
117. Benzidine
118. Pyrene-d10 (SS)
119. Pyrene
120. Aramite (isomer)
121. *p*-Terphenyl-d14 (SS)
122. Aramite (isomer)
123. Dimethylaminoazobenzene
124. Chlorobenzilate
125. 3,3'-Dimethylbenzidine
126. Butyl benzyl phthalate
127. Kepone
128. Bis(2-ethylhexyl) adipate
129. 2-Acetylaminofluorene
130. 3,3'-Dichlorobenzidine
131. Benz[a]anthracene
132. Chrysene-D12 (IS)
133. Bis(2-ethylhexyl)phthalate
134. Chrysene
135. Di-*n*-octyl phthalate
136. 7,12-Dimethylbenzo[a] anthracene
137. Benzo[b]fluoranthene
138. Benzo[k]fluoranthene
139. Benzo[a]pyrene
140. Perylene-D12 (IS)
141. 3-Methylcholanthrene
142. Dibenzo[a,j]acridine
143. Indeno[1,2,3-cd]pyrene
144. Dibenz[a,h]anthracene
145. Benzo[ghi]perylene

Volatile Organic Compounds Retention Time Index: Rtx®-VMS

Data collected using a 60 m, 0.25 mm ID, 1.4 µm Rtx®-VMS column; Oven: 40 °C (hold 6 min) to 230 °C @ 14 °C/min (hold 11 min); Carrier gas: helium; Regulation: constant pressure; Flow rate: 1 mL/min; Linear velocity: 21 cm/sec; Dead time: 4.90 min

for more info

See pages 623–625 for Rtx®-VMS volatile organics chromatograms.

Compound	Rtx®-VMS Ret. Time
Dichlorodifluoromethane	5.52
Chloromethane	6.26
Vinyl chloride	6.54
Water	6.70
Bromomethane	7.61
Methanol	7.93
2-Methylbutane	7.96
Chloroethane	8.00
Trichlorofluoromethane	8.41
n-Pentane	8.61
Diethylether	9.59
1,1-Dichloroethene	9.64
Carbon disulfide	9.65
Freon® 113	9.70
Ethanol	9.74
Iodomethane	9.99
3-Chlorotrifluoropropane	10.45
Chloro-methyl-methylether	10.54
Acrolein	10.57
2-Methylpentane	10.59
Allyl chloride	10.72
Methylene chloride	10.98
3-Methylpentane	11.09
Acetone	11.24
trans-1,2-Dichloroethene	11.24
Methyl *tert*-butyl ether	11.42
2-Propanol	11.52
tert-Butyl alcohol	11.56
Methyl acetate	11.63
Hexane	11.64
Acetonitrile	12.22
Chloroprene	12.30
1,1-Dichloroethane	12.42
Acrylonitrile	12.60
Diisopropyl ether	12.62
2,4-Dimethylpentane	12.68
Vinyl acetate	13.02
Ethyl-*tert*-buyl ether	13.08
1-Propanol	13.18
cis-1,2-Dichloroethene	13.32
Allyl alcohol	13.35
2,2-Dichloropropane	13.48
Bromochloromethane	13.62
Chloroform	13.75
Cyclohexane	13.84
Methyl acrylate	13.87
Carbon tetrachloride	13.94
Tetrahydrofuran	14.03
1,1,1-Trichloroethane	14.06
Ethyl acetate	14.13
2-Butanone	14.18
Dibromofluoromethane	14.18
1,1-Dichloropropene	14.20
Propargyl alcohol	14.35
1-Chlorobutane	14.51
2,2,4-Trimethylpentane	14.53
Propionitrile	14.59
Benzene	14.60
n-Heptane (C7)	14.62
Methacrylonitrile	14.64

Compound	Rtx®-VMS Ret. Time
Benzene-d6	14.72
Pentafluorobenzene	14.75
1,2-Dichloroethane-d4	14.79
1,2-Dichloroethane	14.90
tert-Amyl-methyl ether	15.00
Isobutyl alcohol	15.06
Fluorobenzene	15.16
Isopropyl acetate	15.34
Formic acid	15.37
Trichloroethene	15.39
1,4-Difluorobenzene	15.58
n-Butanol	15.60
Methyl cyclohexane	15.78
Acetic acid	15.93
Dibromomethane	16.05
1,2-Dichloropropane	16.17
Bromodichloromethane	16.23
Methyl methacrylate	16.28
α,α,α-Trifluorotoluene	16.45
1,4-Dioxane	16.49
n-Propyl acetate	16.70
2-Chloroethyl-vinyl-ether	16.92
2-Chloroethanol	16.93
cis-1,3-Dichloropropene	17.04
1-Bromo-2-chloroethane	17.05
n-Octane	17.17
Toluene-d8	17.28
Toluene	17.36
Propionic acid	17.61
Chloroacetonitrile	17.64
4-Methyl-2-pentanone	17.76
2-Bromo-1-chloropropane	17.81
2-Nitropropane	17.83
Pyridine	17.86
1,1-Dichloropropanone	17.88
trans-1,3-Dichloropropene	17.88
Tetrachloroethene	17.89
Ethyl methacrylate	17.92
1,1,2-Trichloroethane	18.11
Dibromochloromethane	18.40
1,3-Dichloropropane	18.49
Isobutyric acid	18.55
1,2-Dibromoethane	18.78
n-Butyl acetate	18.80
2-Hexanone	18.82
Butyric acid	19.17
1-Chloro-3-fluorobenzene	19.17
Ethylbenzene	19.36
Chlorobenzene	19.39
1-Chloro-4-fluorobenzene	19.39
Ethylbenzene-d10	19.40
1-Chlorohexane	19.41
1,1,1,2-Tetrachloroethane	19.44
m-Xylene	19.53
p-Xylene	19.54
Chlorobenzene-d5	19.55
1-Chloro-2-fluorobenzene	19.67
o-Xylene	20.13
Stryrene	20.17
Isovaleric acid	20.18

Compound	Rtx®-VMS Ret. Time
Bromoform	20.30
Isopropylbenzene	20.51
1,2-Butanediol	20.82
Valeric acid	20.89
1,4-Dichlorobutane	20.90
Bromobenzene	20.91
4-Bromo-1-fluorobenzene	20.95
cis-1,4-Dichloro-2-butene	20.97
n-Decane	21.04
n-Propylbenzene	21.07
1,1,2,2-Tetrachloroethane	21.10
1,3,5-Trimethylbenzene	21.30
1-Ethyl-4-methylbenzene	21.33
1-Ethyl-3-methylbenzene	21.34
1,2,3-Trichloropropane	21.39
trans-1,4-Dichloro-2-butene	21.40
2-Chlorotoluene	21.40
4-Chlorotoluene	21.61
Cyclohexane	21.78
tert-Butylbenzene	21.81
1-Ethyl-2-methylbenzene	21.82
1,2,4-Trimethylbenzene	21.88
Pentachloroethane	21.92
1,3-Dichloro-2-propanol	22.05
sec-Butylbenzene	22.06
Isocaproic acid	22.09
p-Isopropyltoluene	22.22
1,3-Dichlorobenzene	22.53
Caproic acid	22.55
1,4-Dichlorobenzene	22.64
n-Butylbenzene	22.88
Malononitrile	22.89
Benzyl chloride	23.23
1,2-Dichlorobenzene-d4	23.36
1,2-Dichlorobenzene	23.38
Hexachloroethane	23.63
1-Octanol	23.70
Bis-(2-chloro-isopropyl) ether	24.06
4-Bromo-1-chlorobenzene	24.09
Benzyl alcohol	24.23
Heptanoic acid	24.29
n-Dodecane	24.54
3-Bromochlorobenzene	24.61
1,2-Dibromo-3-chloropropane	24.78
2-Bromochlorobenzene	25.54
Hexachlorobutadiene	25.99
Nitrobenzene	26.02
1,2,4-Trichlorobenzene	26.19
Benzyl acetate	26.29
n-Tridecane	26.51
Naphthalene	27.01
1,2,3-Trichlorobenzene	27.46
n-Tetradecane	28.83
2-Methylnaphthalene	30.36
1-Methylnaphthalene	30.96
n-Pentadecane	31.65
2-Chloronaphthalene	33.36

Volatile Organic Compounds Retention Time Index: Rxi®-624Sil MS*

Data collected using a 30 m x 0.25 mm x 1.400 µm Rxi®-624Sil MS column; Oven: 35 °C (hold 5 min) @ 11 °C/min to 60 °C @ 20 °C/min to 220 °C; Carrier gas: helium; Regulation: constant flow; Flow: 1.17 mL/min; GC Temperature: 35 °C; Inlet Pressure: 7.94 psi; Outlet Pressure: 0.00 psi; Dead Time: 1.780 min; Linear Velocity: 32.68 cm/sec; Detector 1: Mass Spectrometer

*Modeled by Pro *ez*GC software.

for more info

See page 622 for an Rxi®-624Sil MS volatile organics chromatogram.

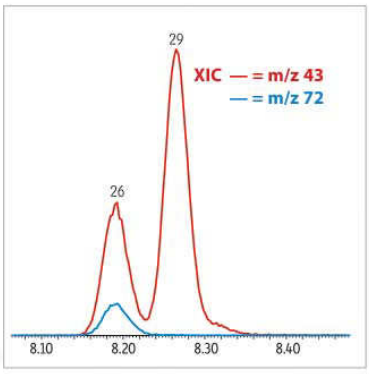
Compound	Rxi®-624Sil MS Ret. Time
Dichlorodifluoromethane	2.178
Chloromethane	2.438
Water	2.588
Vinyl chloride	2.63
Methanol	2.985
Ethylene oxide	3.127
Bromomethane	3.192
Chloroethane	3.395
Trichlorofluoromethane	3.834
n-Pentane	4.032
Ethanol	4.199
Diethylether	4.387
2-Methylbutane	4.501
Acrolein	4.677
1,1-Dichloroethene	4.848
Freon® 113	4.929
Acetone	4.971
Iodomethane	5.135
2-Propanol	5.323
Carbon disulfide	5.323
Acetonitrile	5.581
Methyl acetate	5.676
Allyl chloride	5.693
Methylene chloride	5.939
2-Methylpentane	6.01
tert-Butyl alcohol	6.19
Acrylonitrile	6.414
Methyl-d3-*tert*-butyl-ether	6.435
Methyl *tert*-butyl-ether	6.477
trans-1,2-Dichloroethene	6.48
3-Methylpentane	6.503
Hexane	7.023
1,1-Dichloroethane	7.291
Allyl alcohol	7.309
Vinyl acetate	7.33
Diisopropyl ether	7.386
Chloroprene	7.407
1-Propanol	7.431
Ethyl *tert*-buyl ether	7.978
TB(d9)A	8.133
cis-1,2-Dichloroethene	8.204
2-Butanone	8.208
2,2-Dichloropropane	8.208
Ethyl acetate	8.283
Propionitrile	8.297
Methyl acrylate	8.336
Methacrylonitrile	8.499
Bromochloromethane	8.528
Tetrahydrofuran	8.542
Chloroform	8.678
Dibromofluoromethane	8.871
1,1,1-Trichloroethane	8.872
Pentafluorobenzene	8.937

Compound	Rxi®-624Sil MS Ret. Time
Cylcohexane	8.959
1-Chlorobutane	9.032
Carbon tetrachloride	9.055
1,1-Dichloropropene	9.067
Benzene-d6	9.255
1,2-Dichloroethane-d4	9.28
Benzene	9.296
1,2-Dichloroethane	9.365
Isopropyl acetate	9.376
2,2,4-Trimethylpentane	9.455
Isobutyl alcohol	9.456
tert-Amyl-methyl ether	9.457
n-Heptane	9.537
Fluorobenzene	9.636
1,4-Difluorobenzene	9.784
1-Butanol	9.911
Trichloroethene	10.013
Methyl cyclohexane	10.268
tert-Amyl ethyl ether	10.27
1,2-Dichloropropane	10.28
α,α,α-Trifluorotoluene	10.325
Methyl methacrylate	10.327
1,4-Dioxane	10.379
n-Propyl acetate	10.383
Dibromomethane	10.443
Bromodichloromethane	10.532
2-Nitropropane	10.736
Chloroacetonitrile	10.764
2-Chloroethyl-vinyl-ether	10.792
1-Bromo-2-chloroethane	10.843
Epichlorhydrin	10.875
cis-1,3-Dichloropropene	10.938
2,4-Dimethylpentane	10.961
4-Methyl-2-pentanone	11.062
1,1-Dichloropropanone	11.105
Pyridine	11.135
Toluene-d8	11.185
Toluene	11.246
n-Octane	11.345
trans-1,3-Dichloropropene	11.441
Ethyl methacrylate	11.471
2-Bromo-1-chloropropane	11.497
1,1,2-Trichloroethane	11.619
Tetrachloroethene	11.699
1,3-Dichloropropane	11.761
n-Butyl acetate	11.792
Dibromochloromethane	11.82
1,2-Dibromoethane	11.934
1-Chloro-3-fluorobenzene	12.119
1-Chloro-4-fluorobenzene	12.338
Chlorobenzene-D5	12.386
Chlorobenzene	12.415
Ethylbenzene-d10	12.44

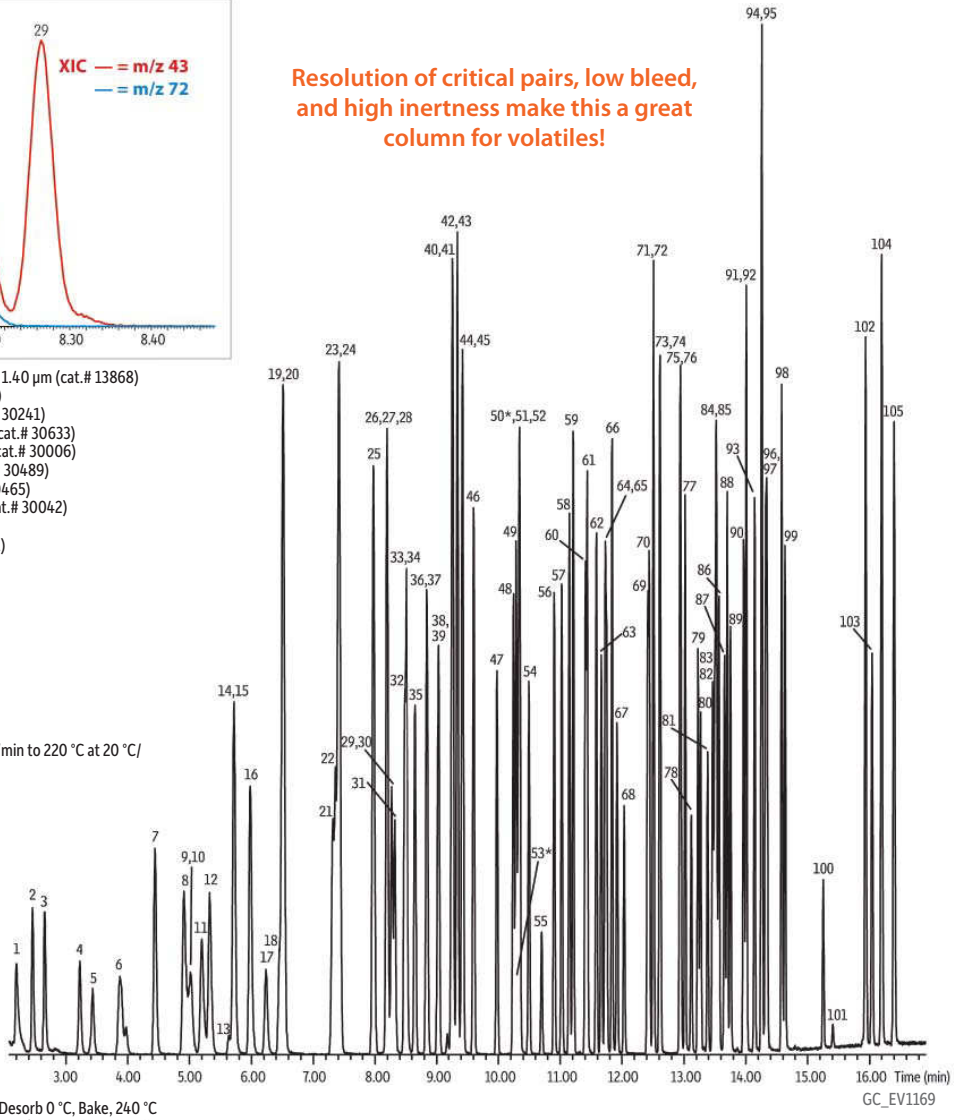
Compound	Rxi®-624Sil MS Ret. Time
1-Chlorohexane	12.442
1,1,1,2-Tetrachloroethane	12.503
Ethylbenzene	12.512
m-Xylene	12.636
p-Xylene	12.636
n-Nonane	12.668
1-Chloro-2-fluorobenzene	12.703
o-Xylene	12.99
Stryrene	13.01
n-Amyl acetate	13.148
Bromoform	13.177
Isopropylbenzene	13.327
cis-1,4-Dichloro-2-butene	13.382
1,4-Dichlorobutane	13.439
4-Bromo-1-fluorobenzene	13.485
1,1,2,2-Tetrachloroethane	13.6
Bromobenzene	13.612
trans-1,4-Dichloro-2-butene	13.635
1,2,3-Trichloropropane	13.655
n-Propylbenzene	13.698
2-Chlorotoluene	13.78
1,3,5-Trimethylbenzene	13.858
n-Decane	13.867
4-Chlorotoluene	13.886
tert-Butylbenzene	14.131
Pentachloroethane	14.16
1,2,4-Trimethylbenzene	14.182
sec-Butylbenzene	14.325
n-Butylcyclohexane	14.4
1,3-Dichlorobenzene	14.431
p-Isopropyltoluene	14.453
1,4-Dichlorobenzene-d4	14.497
1,4-Dichlorobenzene	14.519
n-Butylbenzene	14.796
1,2-Dichlorobenzene-d4	14.814
1,2-Dichlorobenzene	14.823
Hexachloroethane	15.06
1-Octanol	15.07
4-Bromo-1-chlorobenzene	15.467
1,2-Dibromo-3-chloropropane	15.476
Nitrobenzene	15.638
Tetraethyl lead	15.652
2-Bromochlorobenzene	15.761
n-Tetradecane	15.783
n-Dodecane	15.784
1,2,4-Trichlorobenzene	16.176
Hexachlorobutadiene	16.293
Naphthalene	16.418
1,2,3-Trichlorobenzene	16.608
2,5-Dibromotoluene	17.488
2-Methylnaphthalene	17.558
1-Methyl-naphthalene	17.754

Volatiles by EPA Method 8260 on Rxi®-624Sil MS (30 m, 0.25 mm ID, 1.40 µm)

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.



Resolution of critical pairs, low bleed, and high inertness make this a great column for volatiles!



Column Rxi®-624Sil MS, 30 m, 0.25 mm ID, 1.40 µm (cat.# 13868)
Sample 8260A surrogate mix (cat.# 30240)
8260A internal standard mix (cat.# 30241)
8260B MegaMix® calibration mix (cat.# 30633)
VOA calibration mix #1 (ketones) (cat.# 30006)
8260B acetate mix (Revised) (cat.# 30489)
California oxygenates mix (cat.# 30465)
502.2 calibration mix #1 (gases) (cat.# 30042)
Conc.: 25 ppb in RO water
Injection Purge and trap split (split ratio 30:1)
Inj. Temp.: 225 °C
Purge and Trap
Instrument: OI Analytical 4660
Trap Type: 10 Trap
Purge: 11 min @ 20 °C
Desorb Preheat Temp.: 180 °C
Desorb: 0.5 min @ 190 °C
Bake: 5 min @ 210 °C
Interface Connection: injection port
Oven
Oven Temp: 35 °C (hold 5 min) to 60 °C at 11 °C/min to 220 °C at 20 °C/min (hold 2 min)
Carrier Gas He, constant flow
Flow Rate: 1.0 mL/min
Detector MS
Mode: Scan
Transfer Line Temp.: 230 °C
Analyzer Type: Quadrupole
Source Temp.: 230 °C
Quad Temp.: 150 °C
Electron Energy: 70 eV
Solvent Delay Time: 1.5 min
Tune Type: BFB
Ionization Mode: EI
Scan Range: 36-260 amu
Instrument Agilent 7890A GC & 5975C MSD
Notes Other Purge and Trap Conditions:
Sample Inlet: 40 °C
Sample: 40 °C
Water Management: Purge 110 °C, Desorb 0 °C, Bake, 240 °C

Acknowledgement Eclipse 4660 purge and trap courtesy of O.I. Analytical, College Station, TX.

	Peaks	t_R (min)
1.	Dichlorodifluoromethane (CFC-12)	2.198
2.	Chloromethane	2.459
3.	Vinyl chloride	2.659
4.	Bromomethane	3.226
5.	Chloroethane	3.434
6.	Trichlorofluoromethane (CFC-11)	3.876
7.	Diethyl ether (ethyl ether)	4.440
8.	1,1-Dichloroethene	4.909
9.	1,1,2-Trichlorotrifluoroethane (CFC-113)	4.998
10.	Acetone	5.029
11.	Iodomethane	5.195
12.	Carbon disulfide	5.323
13.	Acetonitrile	5.637
14.	Allyl chloride	5.715
15.	Methyl acetate	5.723
16.	Methylene chloride	5.981
17.	*tert*-Butyl alcohol	6.234
18.	Acrylonitrile	6.451
19.	Methyl *tert*-butyl ether (MTBE)	6.509
20.	*trans*-1,2-Dichloroethene	6.512
21.	1,1-Dichloroethane	7.315
22.	Vinyl acetate	7.359
23.	Diisopropyl ether (DIPE)	7.407
24.	Chloroprene	7.429
25.	Ethyl *tert*-butyl ether (ETBE)	7.970
26.	2-Butanone (MEK)	8.193

	Peaks	t_R (min)
27.	*cis*-1,2-Dichloroethene	8.193
28.	2,2-Dichloropropane	8.193
29.	Ethyl acetate	8.265
30.	Propionitrile	8.276
31.	Methyl acrylate	8.318
32.	Methacrylonitrile	8.476
33.	Bromochloromethane	8.507
34.	Tetrahydrofuran	8.521
35.	Chloroform	8.651
36.	1,1,1-Trichloroethane	8.843
37.	Dibromofluoromethane	8.848
38.	Carbon tetrachloride	9.026
39.	1,1-Dichloropropene	9.037
40.	1,2-Dichloroethane-d4	9.246
41.	Benzene	9.262
42.	1,2-Dichloroethane	9.334
43.	Isopropyl acetate	9.340
44.	Isobutyl alcohol	9.421
45.	*tert*-Amyl methyl ether (TAME)	9.421
46.	Fluorobenzene	9.598
47.	Trichloroethene	9.976
48.	1,2-Dichloropropane	10.243
49.	Methyl methacrylate	10.290
50.	1,4-Dioxane (ND)	10.299*
51.	Dibromomethane	10.326
52.	Propyl acetate	10.346
53.	2-Chloroethanol (ND)	10.368*

	Peaks	t_R (min)
54.	Bromodichloromethane	10.496
55.	2-Nitropropane	10.698
56.	*cis*-1,3-Dichloropropene	10.904
57.	4-Methyl-2-pentanone (MIBK)	11.026
58.	Toluene-D8	11.148
59.	Toluene	11.210
60.	*trans*-1,3-Dichloropropene	11.407
61.	Ethyl methacrylate	11.435
62.	1,1,2-Trichloroethane	11.585
63.	Tetrachloroethene	11.662
64.	1,3-Dichloropropane	11.729
65.	2-Hexanone	11.749
66.	Butyl acetate	11.837
67.	Dibromochloromethane	11.921
68.	1,2-Dibromoethane (EDB)	12.035
69.	Chlorobenzene-d5	12.412
70.	Chlorobenzene	12.440
71.	Ethylbenzene	12.507
72.	1,1,1,2-Tetrachloroethane	12.507
73.	*m*-Xylene	12.612
74.	*p*-Xylene	12.612
75.	*o*-Xylene	12.935
76.	Styrene	12.949
77.	*n*-Amyl acetate	13.018
78.	Bromoform	13.118
79.	Isopropylbenzene (cumene)	13.226
80.	*cis*-1,4-Dichloro-2-butene	13.268

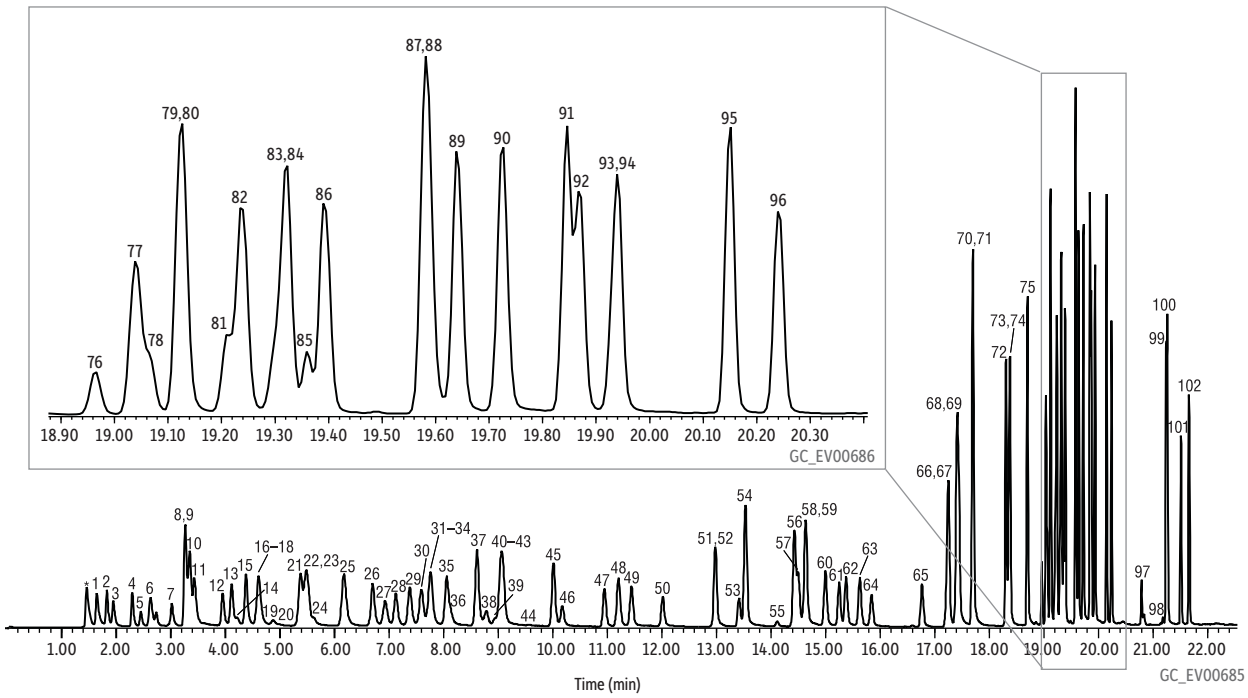
	Peaks	t_R (min)
81.	4-Bromofluorobenzene	13.385
82.	1,1,2,2-Tetrachloroethane	13.456
83.	*trans*-1,4-Dichloro-2-butene	13.496
84.	Bromobenzene	13.515
85.	1,2,3-Trichloropropane	13.526
86.	*n*-Propylbenzene	13.565
87.	2-Chlorotoluene	13.657
88.	1,3,5-Trimethylbenzene	13.699
89.	4-Chlorotoluene	13.751
90.	*tert*-Butylbenzene	13.965
91.	Pentachloroethane	14.007
92.	1,2,4-Trimethylbenzene	14.010
93.	*sec*-Butylbenzene	14.140
94.	4-Isopropyltoluene (*p*-cymene)	14.254
95.	1,3-Dichlorobenzene	14.263
96.	1,4-Dichlorobenzene-D4	14.321
97.	1,4-Dichlorobenzene	14.340
98.	*n*-Butylbenzene	14.579
99.	1,2-Dichlorobenzene	14.635
100.	1,2-Dibromo-3-chloropropane (DBCP)	15.252
101.	Nitrobenzene	15.407
102.	1,2,4-Trichlorobenzene	15.935
103.	Hexachloro-1,3-butadiene	16.040
104.	Naphthalene	16.196
105.	1,2,3-Trichlorobenzene	16.396

* ND = not detected; retention time determined by wet needle injection

Volatile Organics by EPA Method 8260 (80 ppb Standard) on Rtx®-VMS

restek innovation!

Good choice for alcohols & oxygenates!



Column	Rtx®-VMS, 30 m, 0.25 mm ID, 1.4 µm (cat.# 19915)
Sample	8260B MegaMix® calibration mix kit (cat.# 30475) California oxygenates mix (cat.# 30465) VOA calibration mix #1 (ketones) (cat.# 30006) 8260A surrogate mix (cat.# 30240) 8260 internal standard mix (cat.# 30074)
Injection	Purge and trap split (split ratio 25:1)
Inj. Temp.:	250 °C
Purge and Trap	
Instrument:	O.I. Analytical 4560 with 4551A Autosampler
Trap Type:	#10 (Tenax®/silica gel/carbon molecular sieve)
Purge:	11 min @ 20 °C, flow 38 mL/min
Desorb Preheat Temp.:	150 °C
Desorb:	1.0 min @ 190 °C, flow 32 mL/min
Bake:	10 min @ 210 °C
Transfer Line Temp.:	110 °C
Oven	
Oven Temp:	35 °C (hold 7 min) to 90 °C at 4 °C/min to 220 °C at 45 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1.3 mL/min
Dead Time:	1.47 min @ 35 °C
Detector	Agilent 5971A GC-MS
Transfer Line Temp.:	280 °C
Tune Type:	PFTBA/BFB
Scan Range:	35-260 amu
Notes	Sample Size: 10 mL Sample Temp: 40 °C Water Management: 110 °C purge, 0 °C desorb, 240 °C bake 6-Port Valve: 110 °C Sparge Mount: 45 °C Valve Manifold: 50 °C Other Conditions: prepurge, preheat, dry purge OFF
Acknowledgement	Purge & trap courtesy of O.I. Analytical

Peaks

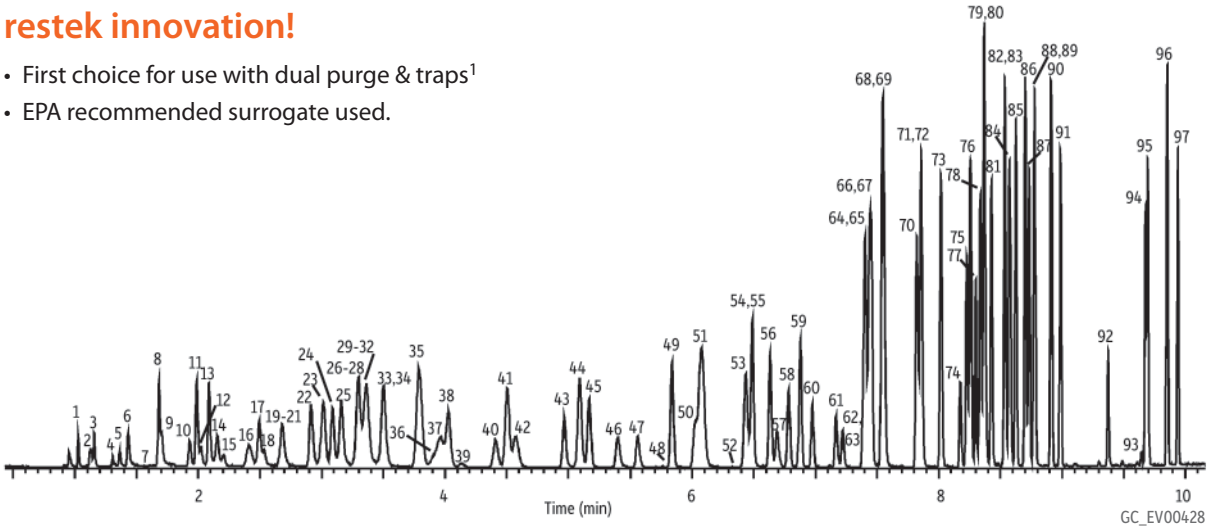
1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethene
9. Carbon disulfide
10. 1,1,2-Trichloro-1,2,2-trifluoro-ethane
11. Iodomethane
12. Allyl chloride
13. Methylene chloride
14. Acetone
15. *trans*-1,2-Dichloroethene
16. Methyl-d3-*tert*-butyl-ether
17. Methyl acetate
18. Methyl *tert*-butyl ether
19. *tert*-Butyl alcohol
20. Acetonitrile
21. Diisopropyl ether
22. Chloroprene
23. 1,1-Dichloroethane
24. Acrylonitrile
25. Ethyl *tert*-butyl ether
26. *cis*-1,2-Dichloroethene
27. 2,2-Dichloropropane
28. Bromochloromethane
29. Chloroform
30. Carbon tetrachloride
31. Tetrahydrofuran
32. Methyl acrylate
33. 1,1,1-Trichloroethane
34. Dibromofluoromethane
35. 1,1-Dichloropropene
36. 2-Butanone
37. Benzene
38. Propionitrile
39. Methacrylonitrile
40. 1,2-Dichloroethane-d4
41. Pentafluorobenzene
42. *tert*-Amyl methyl ether
43. 1,2-Dichloroethane
44. Isobutyl alcohol
45. Trichloroethene
46. 1,4-Difluorobenzene
47. Dibromomethane
48. 1,2-Dichloropropane
49. Bromodichloromethane
50. Methyl methacrylate
51. *cis*-1,3-Dichloropropene
52. 2-Chloroethyl vinyl ether
53. Toluene-d8
54. Toluene
55. 2-Nitropropane
56. Tetrachloroethene
57. 2-Bromo-1-chloropropane
58. 4-Methyl-2-pentanone
59. *trans*-1,3-Dichloropropene
60. 1,1,2-Trichloroethane
61. Ethyl methacrylate
62. Dibromochloromethane
63. 1,3-Dichloropropane
64. 1,2-Dibromoethane
65. 2-Hexanone
66. Chlorobenzene-d5
67. Chlorobenzene
68. Ethylbenzene
69. 1,1,1,2-Tetrachloroethane
70. *m*-Xylene
71. *p*-Xylene
72. *o*-Xylene
73. Bromoform
74. Styrene
75. Isopropylbenzene
76. 4-Bromo-1-fluorobenzene (SS)
77. Bromobenzene
78. *cis*-1,4-Dichloro-2-butene
79. 1,4-Dichlorobutane
80. *n*-Propylbenzene
81. 1,1,2,2-Tetrachloroethane
82. 2-Chlorotoluene
83. 1,2,3-Trichloropropane
84. 1,3,5-Trimethylbenzene
85. *trans*-1,4-Dichloro-2-butene
86. 4-Chlorotoluene
87. *tert*-Butylbenzene
88. Pentachloroethane
89. 1,2,4-Trimethylbenzene
90. *sec*-Butylbenzene
91. *p*-Isopropyltoluene
92. 1,3-Dichlorobenzene
93. 1,4-Dichlorobenzene-D4
94. 1,4-Dichlorobenzene
95. *n*-Butylbenzene
96. 1,2-Dichlorobenzene
97. 1,2-Dibromo-3-chloropropane
98. Nitrobenzene
99. Hexachlorobutadiene
100. 1,2,4-Trichlorobenzene
101. Naphthalene
102. 1,2,3-Trichlorobenzene

*Carbon dioxide

Volatile Organics by EPA 8260B on Rtx®-VMS

restek innovation!

- First choice for use with dual purge & traps[1]
- EPA recommended surrogate used.



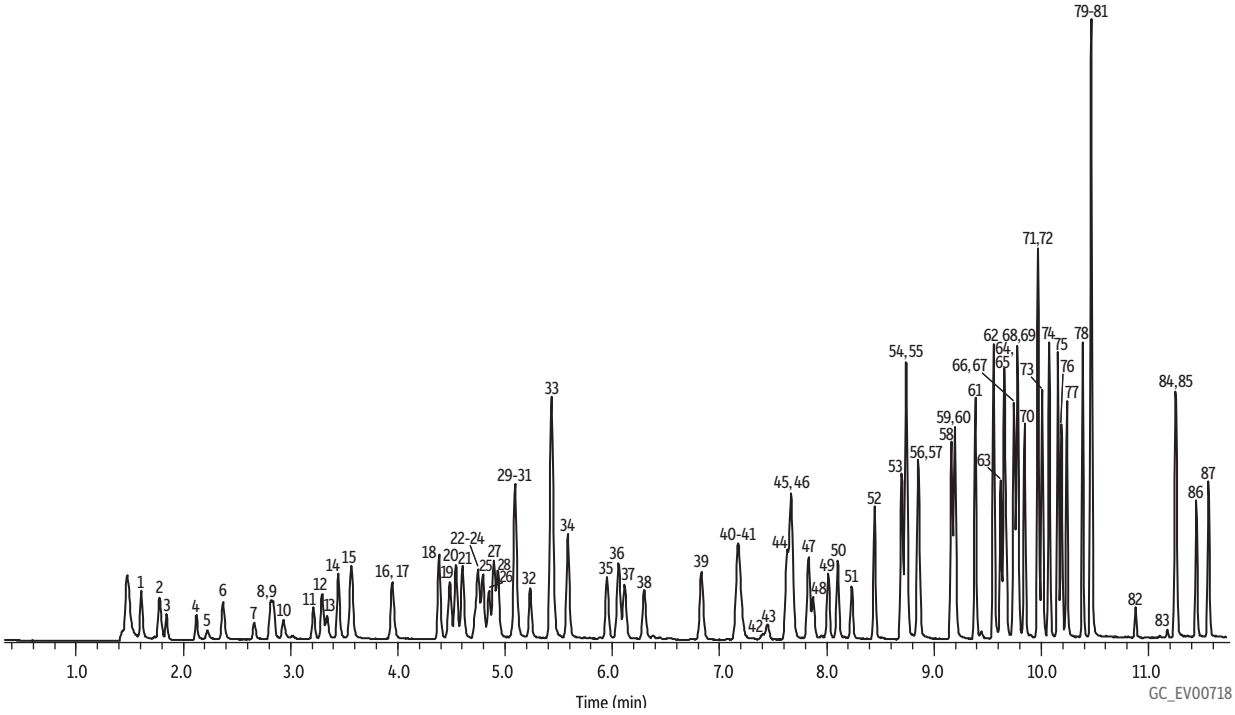
Column	Rtx®-VMS, 20 m, 0.18 mm ID, 1.00 µm (cat.# 49914)
Sample	
Diluent:	Water
Conc.:	10 ppb in 5 mL RO water (unless noted); ketones 2.5X
Injection	Purge and trap split (split ratio 40:1)
Liner:	1 mm split (cat.# 20973)
Inj. Temp.:	220 °C
Purge and Trap	
Instrument:	Tekmar LCS 3100
Trap Type:	Vocarb® 3000
Purge:	11 min @ ambient, flow 40 mL/min
Dry Purge:	1 min, flow 40 mL/min
Desorb Preheat Temp.:	245 °C
Desorb:	2 min @ 250 °C, flow 40 mL/min
Bake:	8 min @ 260 °C
Interface Connection:	Injection port
Transfer Line Tubing:	Silcosteel® treated 0.53 mm ID tubing (cat.# 20595)
Transfer Line Temp.:	120 °C
Oven	
Oven Temp:	50 °C (hold 4 min) to 100 °C at 18 °C/min (hold 0 min) to 230 °C at 40 °C/min (hold 3 min)
Carrier Gas	He, constant flow
Flow Rate:	1.0 mL/min
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Analyzer Type:	Quadrupole
Tune Type:	BFB
Ionization Mode:	EI
Scan Range:	35-300 amu
Instrument	HP6890 GC & 5973 MSD
Notes	For proper flows, adjust retention time of dichlorodifluoromethane to a retention time of 1.03 min @ 50 °C

[1]A.L. Hilling and G. Smith, Environmental Testing & Analysis, 10(3), 15-19, 2001.

Peaks

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Ethanol (2,500 ppb)
8. 1,1-Dichloroethene
9. Carbon disulfide (40 ppb)
10. Allyl chloride
11. Methylene chloride
12. Acetone
13. *trans*-1,2-Dichloroethene
14. Methyl *tert*-butyl ether
15. *tert*-Butyl alcohol (100 ppb)
16. Diisopropyl ether
17. 1,1-Dichloroethane
18. Acrylonitrile
19. Vinyl acetate
20. Allyl alcohol (250 ppb)
21. Ethyl *tert*-butyl ether
22. *cis*-1,2-Dichloroethene
23. 2,2-Dichloropropane
24. Bromochloromethane
25. Chloroform
26. Ethyl acetate
27. Carbon tetrachloride
28. Methyl acrylate
29. Propargyl alcohol (500 ppb)
30. Dibromofluoromethane (SMC)
31. Tetrahydrofuran
32. 1,1,1-Trichloroethane
33. 2-Butanone
34. 1,1-Dichloropropene
35. Benzene
36. Pentafluorobenzene (IS)
37. *tert*-Amyl Methyl ether
38. 1,2-Dichloroethane
39. Isobutyl alcohol (500 ppb)
40. Isopropyl acetate
41. Trichloroethene
42. 1,4-Difluorobenzene (SMC)
43. Dibromomethane
44. 1,2-Dichloropropane
45. Bromodichloromethane
46. Methyl methacrylate
47. *n*-Propyl acetate
48. 2-Chloroethanol (2,500 ppb)
49. *cis*-1,3-Dichloropropene
50. Toluene-d8 (SMC)
51. Toluene
52. Pyridine (250 ppb)
53. Tetrachloroethene
54. 4-Methyl-2-pentanone
55. *trans*-1,3-Dichloropropene
56. 1,1,2-Trichloroethane
57. Ethyl methacrylate
58. Dibromochloromethane
59. 1,3-Dichloropropane
60. 1,2-Dibromoethane
61. *n*-Butyl acetate
62. 2-Hexanone
63. 2-Picoline (250 ppb)
64. Chlorobenzene-d5 (IS)
65. Chlorobenzene
66. Ethylbenzene
67. 1,1,1,2-Tetrachloroethane
68. *m*-Xylene
69. *p*-Xylene
70. *o*-Xylene
71. Styrene
72. Bromoform
73. Isopropylbenzene
74. 4-Bromofluorobenzene (SMC)
75. Bromobenzene
76. *n*-Propylbenzene
77. 1,1,2,2-Tetrachloroethane
78. 2-Chlorotoluene
79. 1,3,5-Trimethylbenzene
80. 1,2,3-Trichloropropane
81. 4-Chlorotoluene
82. *tert*-Butylbenzene
83. Pentachloroethane
84. 1,2,4-Trimethylbenzene
85. *sec*-Butylbenzene
86. *p*-Isopropyltoluene
87. 1,3-Dichlorobenzene
88. 1,4-Dichlorobenzene-d4 (IS)
89. 1,4-Dichlorobenzene
90. *n*-Butylbenzene
91. 1,2-Dichlorobenzene
92. 1,2-Dibromo-3-Chloropropane
93. Nitrobenzene (250 ppb)
94. Hexachlorobutadiene
95. 1,2,4-Trichlorobenzene
96. Naphthalene
97. 1,2,3-Trichlorobenzene

Volatile Organics by U.S. EPA Method 524.2 Revision IV on Rtx®-VMS



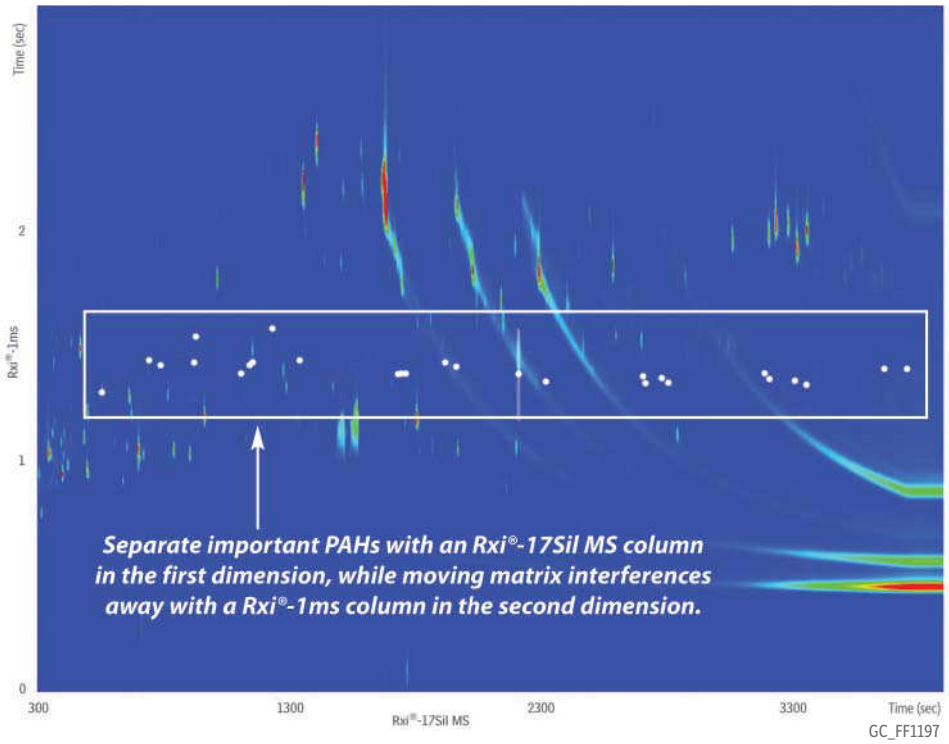
Column	Rtx®-VMS, 30 m, 0.25 mm ID, 1.4 µm (cat.# 19915)
Sample	502.2 calibration mix #1 (gases) (cat.# 30042) Drinking water VOA MegaMix®, 524.2 rev. 4.1 (cat.# 30601) 524 Internal standard/surrogate mix (cat.# 30201) Ketones mix, 524.2 rev. 4.1 (cat.# 30602)
Diluent:	RO water
Conc.:	Compounds at 20 ppb each in 5 mL RO water (ketones at 50 ppb; internal standards at 40 ppb)
Injection	Purge and trap split (split ratio 30:1)
Liner:	1 mm split (cat.# 20972)
Inj. Temp.:	250 °C
Purge and Trap	
Instrument:	Tekmar LSC-3100 purge and trap
Trap Type:	Vocarb 3000 (type K)
Purge:	11 min @ ambient, flow 40 mL/min
Dry Purge:	1 min, flow 40 mL/min
Desorb Preheat Temp:	245 °C
Desorb:	2 min @ 250 °C, flow 33 mL/min
Bake:	8 min @ 260 °C
Interface Connection:	Injection port
Transfer Line Tubing:	Silcosteel® transfer line
Oven	
Oven Temp:	40 °C (hold 2 min) to 85 °C at 14 °C/min (hold 2 min) to 220 °C at 30 °C/min (hold 4 min)
Carrier Gas	He, constant flow
Flow Rate:	1.1 mL/min
Dead Time:	1.48 min @ 40 °C
Detector	MS
Mode:	Scan
Transfer Line Temp.:	280 °C
Tune Type:	PFTBA/BFB
Ionization Mode:	EI
Scan Range:	35-300 amu
Notes	Dry purge: MCS bypassed using Silcosteel® tubing

Peaks

1. Dichlorodifluoromethane
2. Chloromethane
3. Vinyl chloride
4. Bromomethane
5. Chloroethane
6. Trichlorofluoromethane
7. Diethyl ether
8. 1,1-Dichloroethene
9. Carbon disulfide
10. Iodomethane
11. Allyl chloride
12. Methylene chloride
13. Acetone
14. *trans*-1,2-Dichloroethene
15. Methyl *tert*-butyl ether
16. 1,1-Dichloroethane
17. Acrylonitrile
18. *cis*-1,2-Dichloroethene
19. 2,2-Dichloropropane
20. Bromochloromethane
21. Chloroform
22. Methyl acrylate
23. Carbon tetrachloride
24. Tetrahydrofuran
25. 1,1,1-Trichloroethane
26. 2-Butanone
27. 1,1-Dichloropropene
28. 1-Chlorobutane
29. Propionitrile
30. Methacrylonitrile
31. Benzene
32. 1,2-Dichloroethane
33. Fluorobenzene
34. Trichloroethene
35. Dibromomethane
36. 1,2-Dichloropropane
37. Bromodichloromethane
38. Methyl methacrylate
39. *cis*-1,3-Dichloropropene
40. Toluene
41. Chloroacetonitrile
42. 2-Nitropropane
43. 1,1-Dichloropropanone
44. 4-Methyl-2-pentanone
45. Tetrachloroethene
46. *trans*-1,3-Dichloropropene
47. 1,1,2-Trichloroethane
48. Ethyl methacrylate
49. Dibromochloromethane
50. 1,3-Dichloropropane
51. 1,2-Dibromoethane
52. 2-Hexanone
53. Chlorobenzene
54. Ethylbenzene
55. 1,1,1,2-Tetrachloroethane
56. *m*-Xylene
57. *p*-Xylene
58. *o*-Xylene
59. Styrene
60. Bromoform
61. Isopropylbenzene
62. 4-Bromofluorobenzene
63. Bromobenzene
64. *n*-Propylbenzene
65. 1,1,2,2-Tetrachloroethane
66. 2-Chlorotoluene
67. 1,2,3-Trichloropropane
68. 1,3,5-Trimethylbenzene
69. *trans*-1,4-Dichloro-2-butene
70. 4-Chlorotoluene
71. *tert*-Butylbenzene
72. Pentachloroethane
73. 1,2,4-Trimethylbenzene
74. *sec*-Butylbenzene
75. *p*-Isopropyltoluene
76. 1,3-Dichlorobenzene
77. 1,4-Dichlorobenzene
78. *n*-Butylbenzene
79. Hexachloroethane
80. 1,2-Dichlorobenzene-D4
81. 1,2-Dichlorobenzene
82. 1,2-Dibromo-3-Chloropropane
83. Nitrobenzene
84. Hexachlorobutadiene
85. 1,2,4-Trichlorobenzene
86. Naphthalene
87. 1,2,3-Trichlorobenzene

* Peaks 42 & 43 share an ion (43)

QuEChERS Extract of NIST SRM 2974a Freeze-Dried Mussel Tissue (GCxGC contour plot)

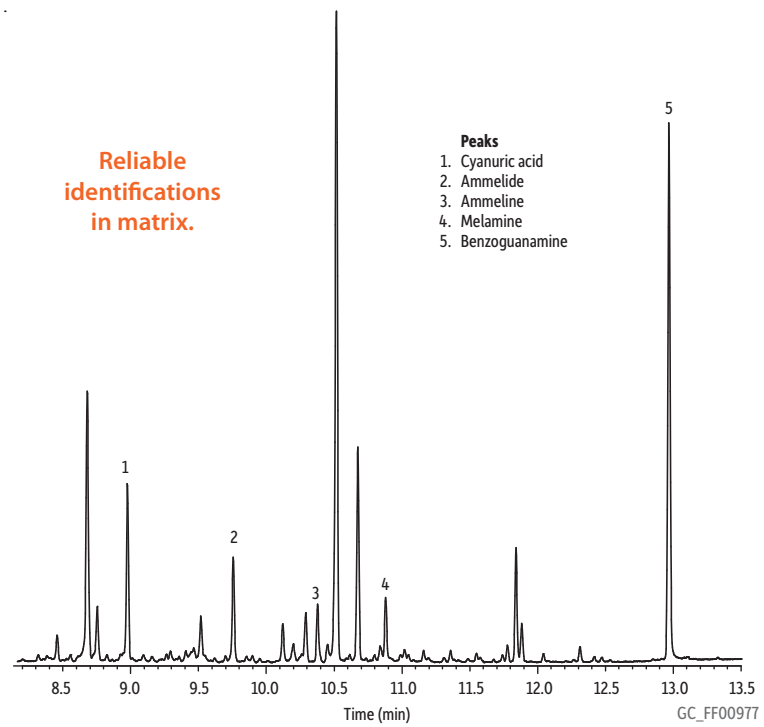


GC_FF1197

Peaks
1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Biphenyl
5. 2,6-Dimethylnaphthalene
6. Acenaphthylene
7. Acenaphthene
8. 2,3,5-Trimethylnaphthalene
9. Fluorene
10. Phenanthrene
11. Anthracene
12. 1-Methylphenanthrene
13. Fluoranthene
14. Pyrene
15. Benzo(a)anthracene
16. Chrysene
17. Benzo(b)fluoranthene
18. Benzo(k)fluoranthene
19. Benzo(j)fluoranthene
20. Benzo(e)pyrene
21. Benzo(a)pyrene
22. Perylene
23. Dibenz(a,h)anthracene
24. Indeno(1,2,3-cd)pyrene
25. Benzo(ghi)perylene

Column	Rxi®-17Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 14123) Rxi®-1ms 1.2 m, 0.15 mm ID, 0.15 µm (cat.# custom)
Sample	NIST SRM 2974a freeze-dried mussel tissue with incurred residues
Diluent:	Acetonitrile
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Splitless taper (4 mm) w/semi-volatiles wool (cat.# 20798-231.1)
Inj. Temp.:	250 °C
Purge Flow:	40 mL/min
Oven	
Oven Temp:	Rxi®-17Sil MS: 90 °C (hold 1 min) to 320 °C at 3.75 °C/min (hold 2.67 min) Rxi®-1ms: 95 °C (hold 1 min) to 325 °C at 3.75 °C/min (hold 2.67 min)
Carrier Gas	He, corrected constant flow (2.2 mL/min)
Modulation	
Modulator Temp. Offset:	20 °C
Second Dimension Separation Time:	3 sec
Hot Pulse Time:	0.9 sec
Cool Time between Stages:	0.6 sec
Detector	TOFMS
Transfer Line Temp.:	300 °C
Analyzer Type:	TOF
Source Temp.:	250 °C
Electron Energy:	70 eV
Mass Defect:	-20 mu/100 u
Solvent Delay Time:	5 min
Tune Type:	PFTBA
Ionization Mode:	EI
Acquisition Range:	45 to 550 amu
Spectral Acquisition Rate:	100 spectra/sec
Instrument	LECO Pegasus 4D GCxGC-TOFMS
Notes	PAHs (shown in box) elute in a relatively narrow band and are identified by the white peak marker dots.

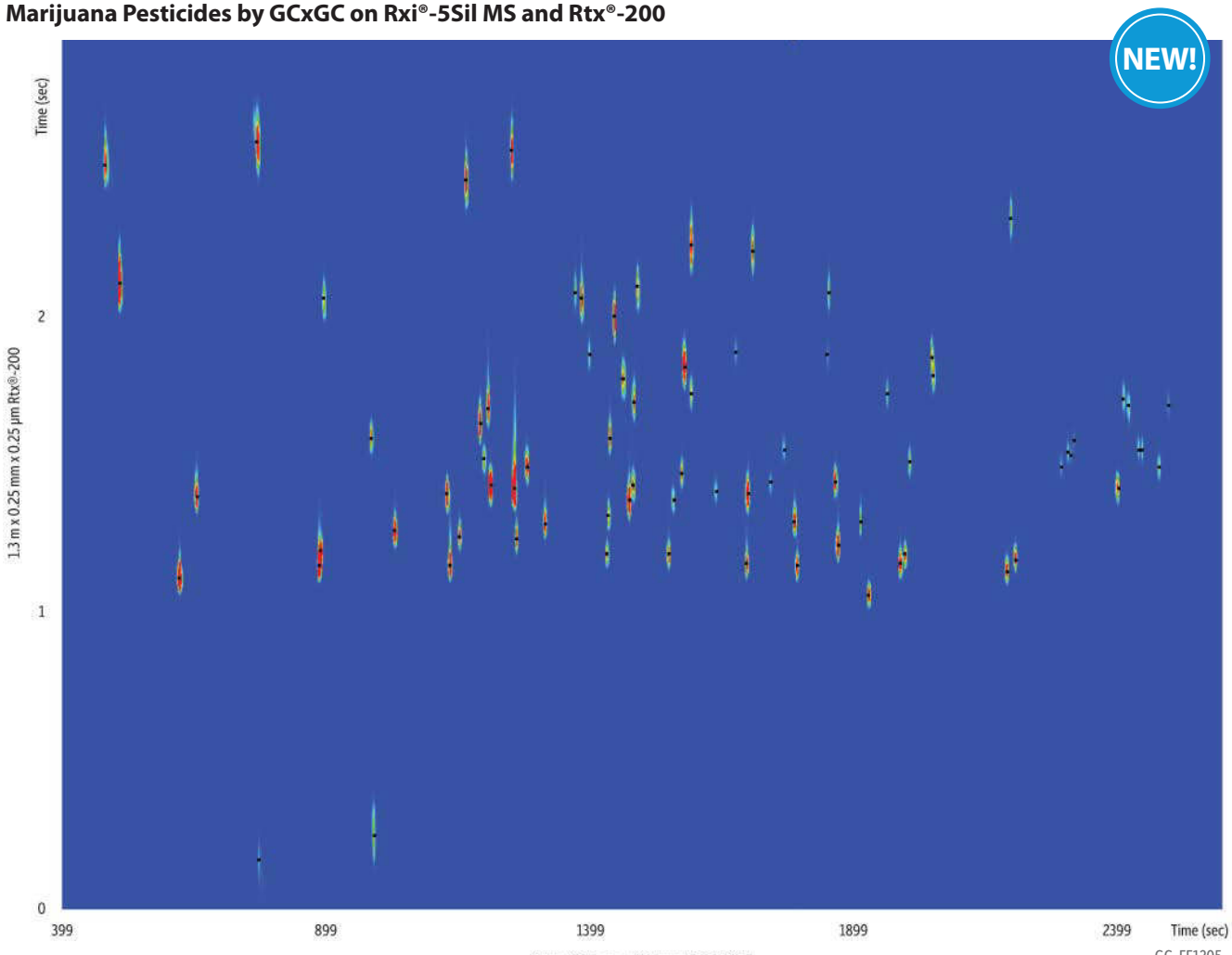
Melamine Spike in Cat Food on Rtx®-5MS



GC_FF00977

Column	Rtx®-5MS, 30 m, 0.25 mm ID, 0.25 µm (cat.# 12623)
Sample	Melamine, cyanuric acid, ammelide, ammeline, benzoguanamine in dry cat food
Conc.:	10 µg/mL prederivatized
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	3.5 mm splitless taper (cat.# 22286)
Inj. Temp.:	280 °C
Oven	
Oven Temp:	75 °C to 320 °C at 15 °C/min (hold 4 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Detector	MS
Mode:	SIM
Transfer Line Temp.:	290 °C
Ionization Mode:	EI

Marijuana Pesticides by GCxGC on Rxi®-5Sil MS and Rtx®-200

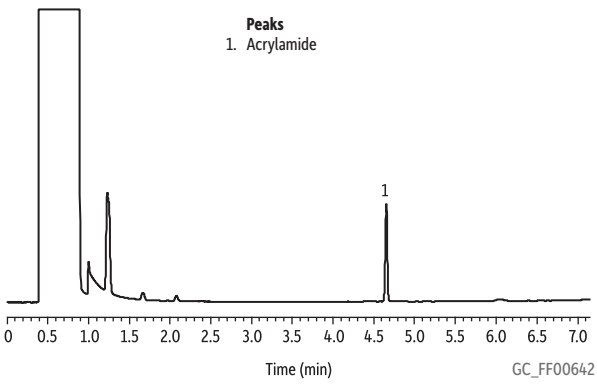


Column	Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623) Rtx®-200 1.3 m, 0.25 mm ID, 0.25 µm (cat.# 15020)
Sample	
Diluent:	Toluene
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Sky® 4 mm single taper w/wool (cat.# 23303.1)
Inj. Temp.:	250 °C
Purge Flow:	40 mL/min
Oven	
Oven Temp:	Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 5 °C/min Rtx®-200: 85 °C (hold 1 min) to 315 °C at 5 °C/min
Carrier Gas	He, corrected constant flow (2 mL/min)
Modulation	
Modulator Temp. Offset:	20 °C
Second Dimension Separation Time:	3 sec
Hot Pulse Time:	0.9 sec
Cool Time between Stages:	0.6 sec
Detector	TOFMS
Transfer Line Temp.:	290 °C
Analyzer Type:	TOF
Source Temp.:	225 °C
Electron Energy:	70 eV
Mass Defect:	-20 mu/100 u
Solvent Delay Time:	5 min
Tune Type:	PFTBA
Ionization Mode:	EI
Acquisition Range:	45-550 amu
Spectral Acquisition Rate:	100 spectra/sec
Instrument	LECO Pegasus 4D GCxGC-TOFMS

	Peaks	t_R 1 (sec)	t_R 2 (sec)
1.	Methamidophos	480	2.51
2.	Dichlorvos	507	2.11
3.	1,2,3,5-Tetrachlorobenzene	621	1.12
4.	Nicotine	654	1.39
5.	Mevinphos	768	2.59
6.	Acephate	771	0.17
7.	Pentachlorobenzene	885	1.16
8.	*o*-Phenylphenol	888	1.21
9.	Tebuthiuron	894	2.06
10.	Tetrachloronitrobenzene	984	1.59
11.	Omethoate	990	0.25
12.	2,3,5,6-Tetrachloroaniline	1029	1.28
13.	α-BHC	1128	1.40
14.	Hexachlorobenzene	1134	1.16
15.	Pentachloroanisole	1152	1.26
16.	Dimethoate	1164	2.46
17.	β-BHC	1191	1.64
18.	Pentachloronitrobenzene	1197	1.52
19.	Pentachlorobenzonitrile	1206	1.69
20.	γ-BHC	1212	1.43
21.	Chlorothalonil	1251	2.56
22.	Anthracene	1257	1.42
23.	Diazinon	1260	1.25
24.	δ-BHC	1281	1.49
25.	Pentachloroaniline	1314	1.30
26.	Vinclozolin	1371	2.08
27.	Carbaryl	1383	2.06
28.	Metalaxyl	1398	1.87
29.	Pentachlorothioanisole	1431	1.20
30.	Pirimiphos methyl	1434	1.33
31.	Methiocarb	1437	1.59
32.	Dichlofluanid	1446	2.00
33.	Malathion	1461	1.79
34.	Chlorpyrifos	1473	1.38
35.	Fenthion	1479	1.43
36.	DCPA	1482	1.71
37.	Parathion	1488	2.10
38.	Cyprodinil	1548	1.20
39.	Heptachlor epoxide	1557	1.38
40.	Thiabendazole	1572	1.47
41.	Captan	1578	1.83
42.	Folpet	1590	1.74
43.	Procymidone	1590	2.24
44.	Endosulfan I	1638	1.41
45.	Imazalil	1674	1.88
46.	4,4'-DDE	1695	1.17
47.	Dieldrin	1698	1.40
48.	Myclobutanil	1707	2.22
49.	Endrin	1740	1.44
50.	Endosulfan II	1767	1.55
51.	4,4'-DDD	1785	1.31
52.	Oxadixyl	1785	2.94
53.	2,4'-DDT	1791	1.16
54.	Carfentrazone ethyl	1848	1.87
55.	Endosulfan sulfate	1851	2.08
56.	Fenhexamid	1863	1.44
57.	4,4'-DDT	1869	1.23
58.	Propargite	1911	1.31
59.	Piperonyl butoxide	1926	1.06
60.	Iprodione	1962	1.74
61.	Bifenthrin	1986	1.17
62.	Dicofol	1995	1.20
63.	Fenpropathrin	2004	1.51
64.	Phosalone	2046	1.86
65.	Azinphos methyl	2049	1.80
66.	*cis*-Permethrin	2190	1.14
67.	Coumaphos	2196	2.33
68.	*trans*-Permethrin	2205	1.18
69.	Cypermethrin 1	2292	1.49
70.	Cypermethrin 2	2304	1.54
71.	Cypermethrin 3	2310	1.53
72.	Cypermethrin 4	2316	1.58
73.	Pyraclostrobin	2400	1.42
74.	Fluvalinate 1	2409	1.72
75.	Fluvalinate 2	2418	1.70
76.	Difenoconazole 1	2439	1.55
77.	Difenoconazole 2	2445	1.55
78.	Deltamethrin	2478	1.49
79.	Azoxystrobin	2496	1.70

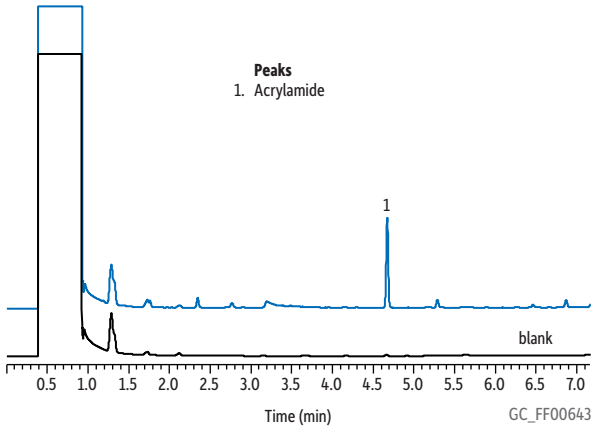
Notes Rtx®-200 (cat.# 15020) is a 15 m column. A 1.3 m section was used as the second dimension column.

Acrylamide (Reference Standard) on Stabilwax®



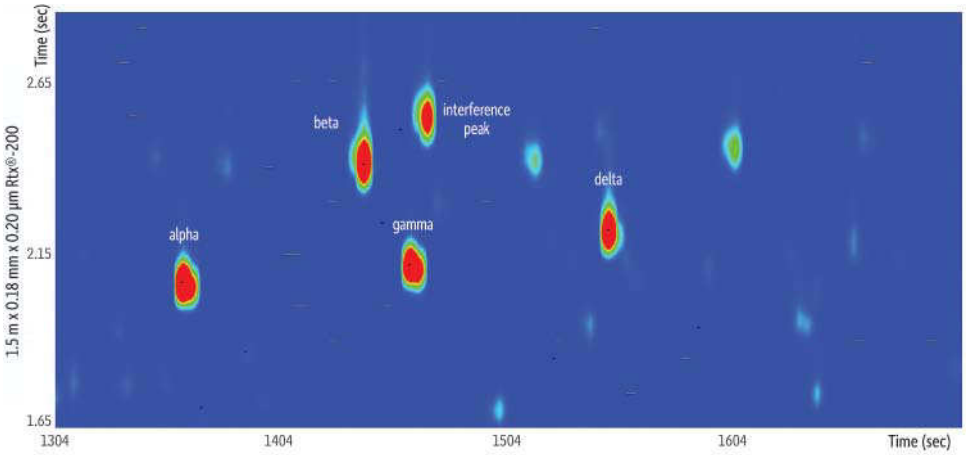
Column	Stabilwax®, 15 m, 0.53 mm ID, 0.50 µm (cat.# 10637)
Sample	Acrylamide standard
Diluent:	Water
Conc.:	25 µg/mL
Injection	
Inj. Vol.:	1 µL splitless (hold 0.5 min)
Liner:	Auto SYS splitless w/wool (2 mm ID) (cat.# 20830)
Inj. Temp.:	260 °C
Oven	
Oven Temp:	100 °C (hold 0.5 min) to 200 °C at 15 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	62 cm/sec @ 100 °C
Detector	FID @ 260 °C

Acrylamide (Potato Chip Extract) on Stabilwax®



Column	Stabilwax®, 15 m, 0.53 mm ID, 0.50 µm (cat.# 10637)
Sample	
Conc.:	1 g of potato chips spiked with 100 µg acrylamide
Injection	
Inj. Vol.:	1 µL splitless (hold 0.5 min)
Liner:	Auto SYS splitless w/wool (2 mm ID) (cat.# 20830)
Inj. Temp.:	260 °C
Oven	
Oven Temp:	100 °C (hold 0.5 min) to 200 °C at 15 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	62 cm/sec @ 100 °C
Detector	FID @ 260 °C

Hexachlorocyclohexanes in Sage QuEChERS Extract (Zoom of GCxGC-TOFMS Contour Plot)

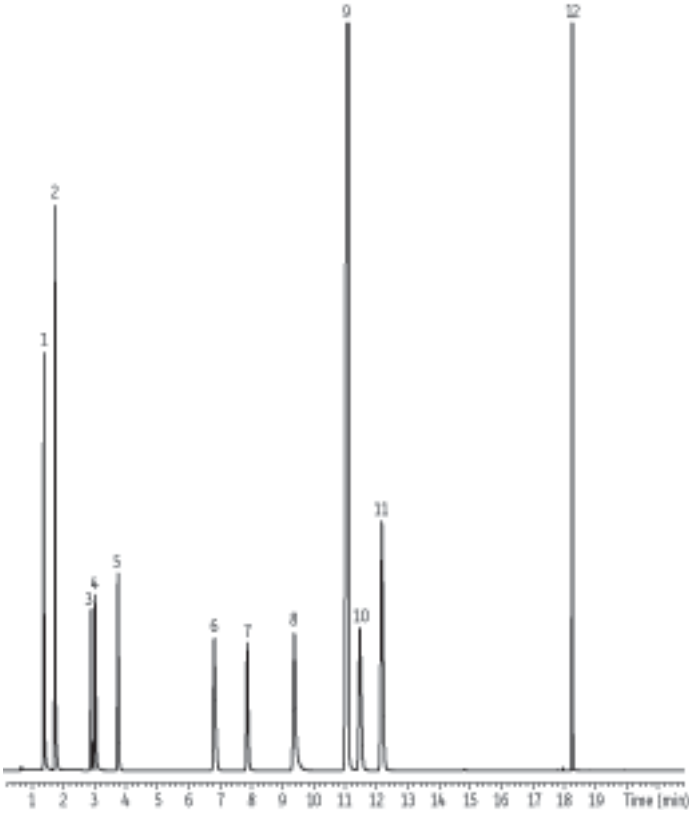


NEW!

GCxGC with orthogonal Rxi®-5Sil MS and Rtx®-200 columns is a powerful way to handle complex samples like dietary supplement extracts. Note separation of gamma-HCH from the isobaric interference above.

Column	Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623) Rtx®-200 1.5 m, 0.18 mm ID, 0.20 µm (cat.# 45001)
Sample	
Diluent:	Toluene
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Purge Flow:	40 mL/min
Oven	
Oven Temp:	Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 4 °C/min (hold 1.5 min) Rtx®-200: 90 °C (hold 1 min) to 320 °C at 4 °C/min (hold 1.5 min)
Carrier Gas	He, constant flow
Flow Rate:	1.8 mL/min
Modulation	
Modulator Temp. Offset:	25 °C
Second Dimension Separation Time:	4 sec
Hot Pulse Time:	1.2 sec
Cool Time between Stages:	0.8 sec
Detector	TOFMS
Transfer Line Temp.:	290 °C
Analyzer Type:	TOF
Source Temp.:	225 °C
Electron Energy:	70 eV
Mass Defect:	-20 mu/100 u
Solvent Delay Time:	4 min
Ionization Mode:	EI
Acquisition Range:	45 to 550 amu
Spectral Acquisition Rate:	100 spectra/sec
Instrument	LECO Pegasus 4D GCxGC-TOFMS
Notes	See application note GNAN1338 for extraction and cleanup details. A 1.5 m length of the Rtx®-200 column was trimmed from a 10 m column. Columns were connected with a universal Press-Tight® connector (cat.# 20429).

Food Packaging Volatiles on Rtx®-5MS

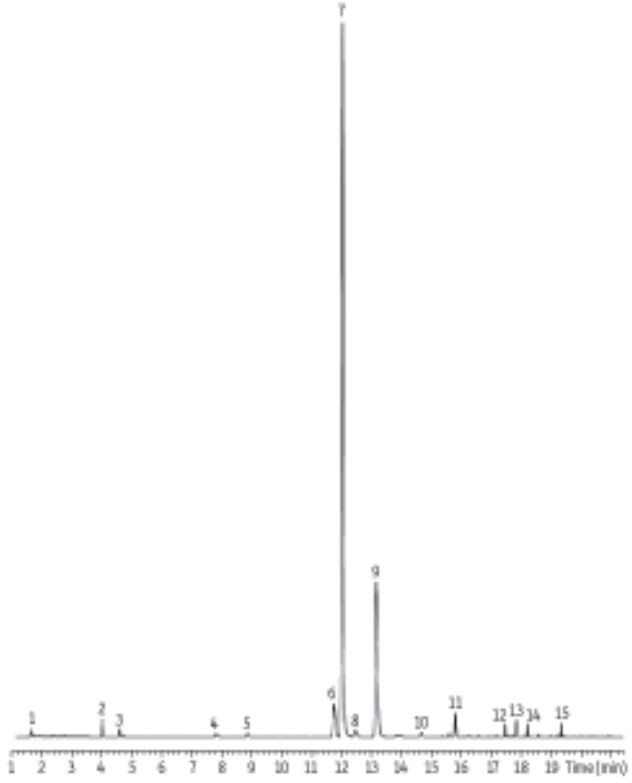


GC_FF00457

Peaks
1. Isopropanol
2. Methylene chloride
3. 2-Methyl-1-propanol
4. Tetrahydrofuran
5. Benzene
6. Toluene
7. Hexanal
8. Furfural
9. 4-Heptanone (IS)
10. Butyl ether
11. Styrene
12. Dodecane

Column	Rtx®-5MS, 30 m, 0.25 mm ID, 1.00 µm (cat.# 12653)
Injection	Purge and trap split (split ratio 20:1)
Liner:	1 mm ID
Inj. Temp.:	250 °C
Purge and Trap	
Instrument:	Tekmar LSC-3100 purge & trap
Trap Type:	Vocarb 3000, type K
Purge:	10 min @ 60 °C, flow 40 mL/min
Dry Purge:	3 min, flow 40 mL/min
Desorb Preheat Temp.:	220 °C
Desorb:	2 min @ 245 °C, flow 40 mL/min
Bake:	6 min @ 230 °C
Interface Connection:	injection port
Transfer Line Tubing:	Siltek®/Sulfinert® tubing (cat.# 22501)
Oven	
Oven Temp:	50 °C to 92 °C at 3 °C/min to 220 °C at 20 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Linear Velocity:	36 cm/sec
Detector	MS
Mode:	Scan
Source Temp.:	280 °C
Electron Energy:	EI @ 70 eV
Scan Range:	35-260 amu
Instrument	HP6890 GC & 5973 MSD

Food Packaging Volatiles by Purge & Trap GC-MS on Rtx®-5MS, Overwrap at the Seam



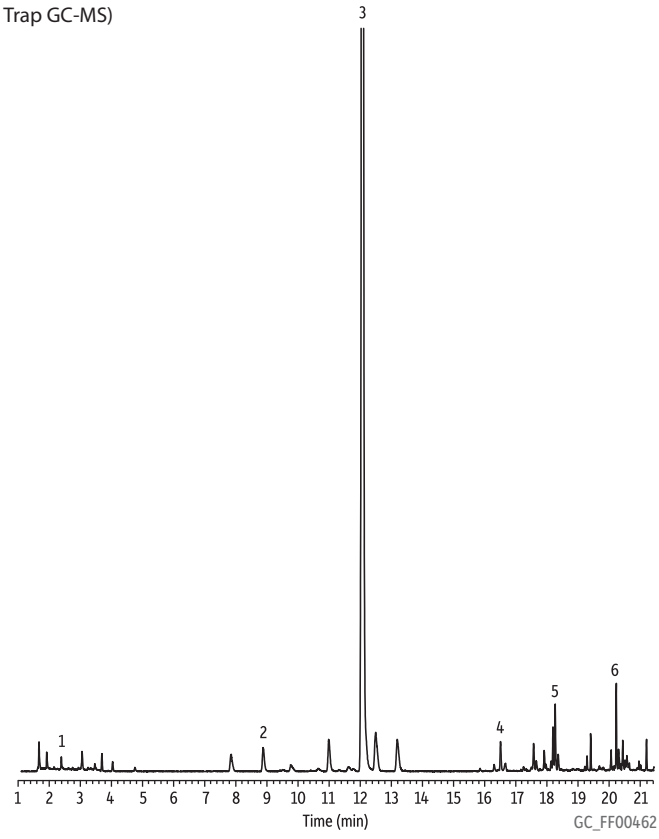
GC_FF00459

Peaks
1. Tetrahydrofuran
2. 1-Butanol
3. Toluene
4. Hexanal
5. Ethylbenzene
6. 4-Heptanone
7. Butyl ether
8. Styrene
9. 1-Methylethylbenzene
10. Propylbenzene
11. Benzaldehyde
12. Benzeneacetaldehyde
13. Acetophenone
14. Benzoic acid, methyl ester
15. Decanal

Column	Rtx®-5MS, 30 m, 0.25 mm ID, 1.00 µm (cat.# 12653)
Injection	Purge and trap split (split ratio 20:1)
Liner:	1 mm ID
Inj. Temp.:	250 °C
Purge and Trap	
Instrument:	Tekmar LSC-3100 purge & trap
Trap Type:	Vocarb 3000, type K
Purge:	10 min @ 60 °C, flow 40 mL/min
Dry Purge:	3 min, flow 40 mL/min
Desorb Preheat Temp.:	220 °C
Desorb:	2 min @ 245 °C, flow 40 mL/min
Bake:	6 min @ 230 °C
Interface Connection:	Injection port
Transfer Line Tubing:	Siltek®/Sulfinert® tubing(cat.# 22501)
Oven	
Oven Temp:	50 °C to 92 °C at 3 °C/min to 220 °C at 20 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Linear Velocity:	36 cm/sec
Detector	MS
Mode:	Scan
Source Temp.:	280 °C
Electron Energy:	EI @ 70 eV
Scan Range:	35-260 amu
Instrument	HP6890 GC & 5973 MSD

Food Packaging Volatiles by Purge & Trap GC-MS on Rtx®-5MS

(Purge & Trap GC-MS)

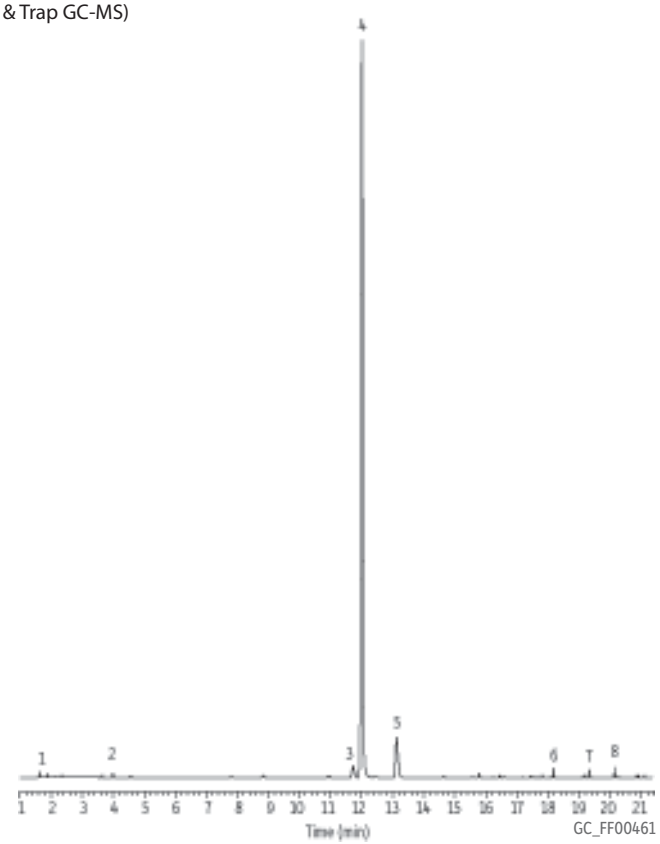


Peaks
1. Ethyl acetate
2. Toluene
3. 4-Heptanone
4. *n*-Butyl ether
5. Styrene
6. Alkanes

Column	Rtx®-5MS, 30 m, 0.25 mm ID, 1.00 µm (cat.# 12653)
Sample	Overwrap, inner bowl
Injection	Purge and trap split (split ratio 20:1)
Liner:	1 mm ID
Inj. Temp.:	250 °C
Purge and Trap	
Instrument:	Tekmar LSC-3100 purge & trap
Trap Type:	Vocarb 3000, type K
Purge:	10 min @ 60 °C, flow 40 mL/min
Dry Purge:	3 min, flow 40 mL/min
Desorb Preheat Temp.:	220 °C
Desorb:	2 min @ 245 °C, flow 40 mL/min
Bake:	6 min @ 230 °C
Interface Connection:	Injection port
Transfer Line Tubing:	Siltek®/Sulfinert® tubing (cat.# 22501)
Oven	
Oven Temp:	50 °C to 92 °C at 3 °C/min to 220 °C at 20 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Linear Velocity:	36 cm/sec
Detector	MS
Mode:	Scan
Source Temp.:	280 °C
Electron Energy:	EI @ 70 eV
Scan Range:	35-260 amu
Instrument	HP6890 GC & 5973 MSD

Food Packaging Volatiles by Purge & Trap GC-MS on Rtx®-5MS

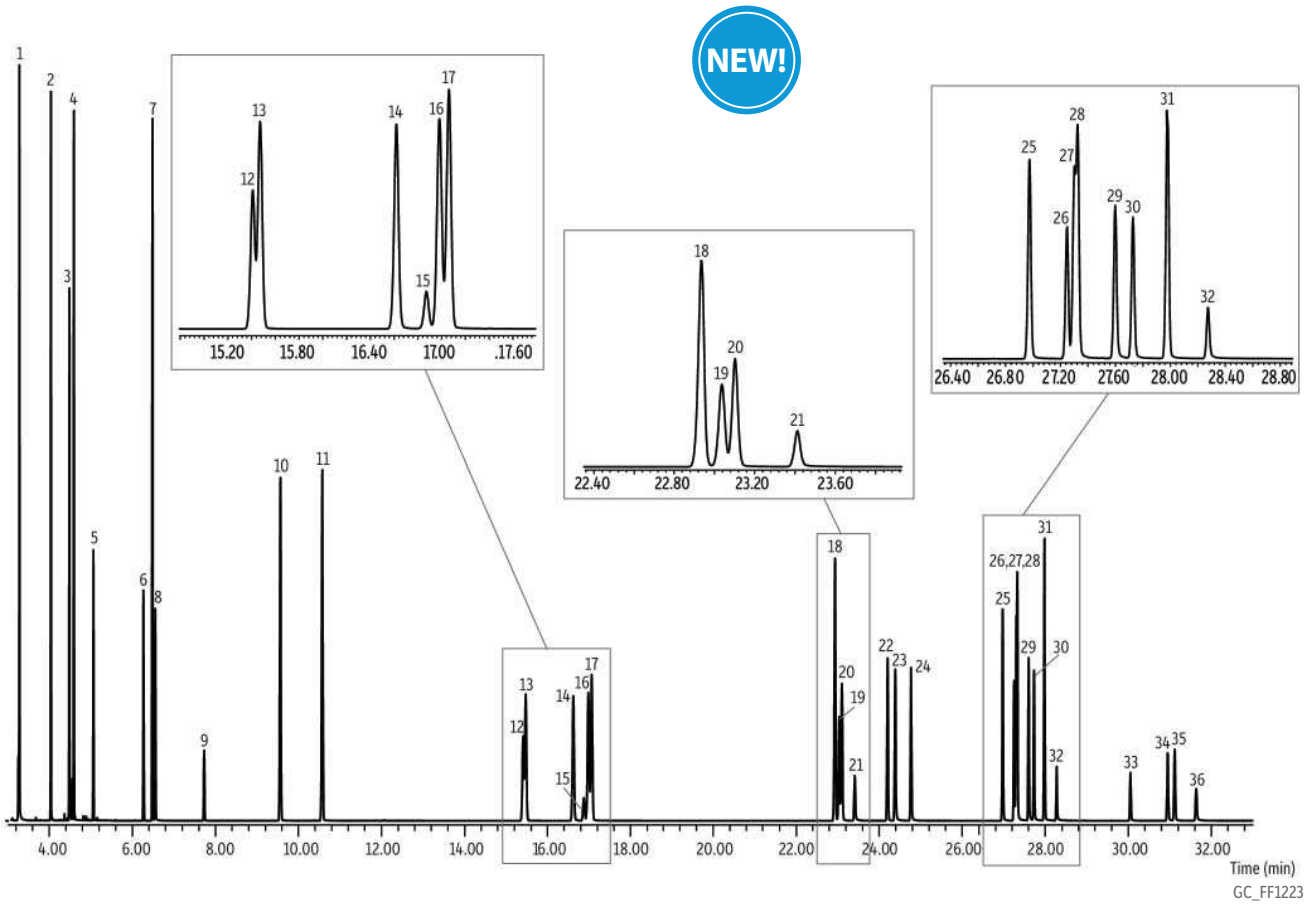
(Purge & Trap GC-MS)



Peaks
1. Tetrahydrofuran
2. Ethylbenzene
3. 4-Heptanone
4. Styrene
5. Benzaldehyde
6. Nonanal
7. Decanal
8. Cinnamaldehyde

Column	Rtx®-5MS, 30 m, 0.25 mm ID, 1.00 µm (cat.# 12653)
Sample	Overwrap, lid of bowl
Injection	Purge and trap split (split ratio 20:1)
Liner:	1 mm ID
Inj. Temp.:	250 °C
Purge and Trap	
Instrument:	Tekmar LSC-3100 purge & trap
Trap Type:	Vocarb 3000, type K
Purge:	10 min @ 60 °C, flow 40 mL/min
Dry Purge:	3 min, flow 40 mL/min
Desorb Preheat Temp.:	220 °C
Desorb:	2 min @ 245 °C, flow 40 mL/min
Bake:	6 min @ 230 °C
Interface Connection:	Injection port
Transfer Line Tubing:	Siltek®/Sulfinert® tubing (cat.# 22501)
Oven	
Oven Temp:	50 °C to 92 °C at 3 °C/min to 220 °C at 20 °C/min (hold 1 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Linear Velocity:	36 cm/sec
Detector	MS
Mode:	Scan
Source Temp.:	280 °C
Electron Energy:	EI @ 70 eV
Scan Range:	35-260 amu
Instrument	HP6890 GC & 5973 MSD

NIST SRM 2260a PAH Mix on Rxi®-PAH



Column	Rxi®-PAH, 40 m, 0.18 mm ID, 0.07 µm (cat.# 49316)
Sample	NIST SRM 2260a PAH mix
Diluent:	Toluene
Conc.:	0.2 - 2 µg/mL (SRM 2260a PAH mix was diluted 5x in toluene)
Injection	
Inj. Vol.:	0.5 µL pulsed splitless (hold 0.58 min)
Liner:	Sky® 2 mm single taper w/wool (cat.# 23316.1)
Inj. Temp.:	275 °C
Pulse Pressure:	80 psi (551.6kPa)
Pulse Time:	0.6 min
Purge Flow:	40 mL/min
Oven	
Oven Temp.:	110 °C (hold 1 min) to 210 °C at 37 °C/min to 260 °C at 3 °C/min to 350 °C at 11 °C/min (hold 4.5 min)
Carrier Gas	He, constant flow
Flow Rate:	1.4 mL/min
Detector	MS
Mode:	SIM

SIM Program:

Group	Start Time (min)	Ion(s) (m/z)	Dwell (ms)
1	3.00	128, 152, 153, 154, 165	40
2	5.50	178, 184, 190, 202	50
3	13.00	226, 228	100
4	20.00	252	200
5	26.00	276, 278	100
6	29.00	300, 302	150

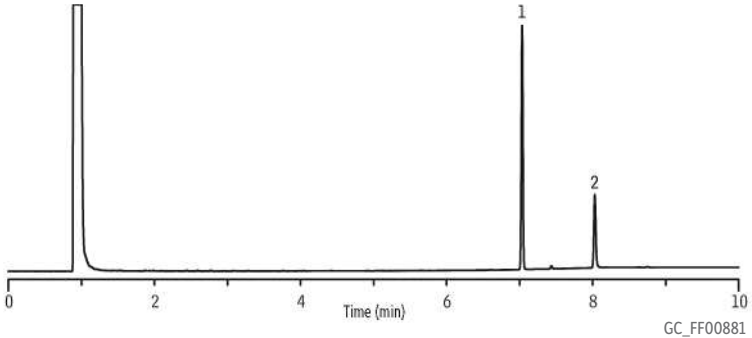
Transfer Line Temp.:	350 °C
Analyzer Type:	Quadrupole
Source Temp.:	350 °C
Quad Temp.:	200 °C
Solvent Delay Time:	3.00 min
Tune Type:	PFTBA
Ionization Mode:	EI
Instrument	Agilent 7890A GC & 5975C MSD

	Peaks	Quant Ion (m/z)	SIM Group #
1.	Naphthalene	128	1
2.	Biphenyl	154	1
3.	Acenaphthylene	152	1
4.	Acenaphthene	153	1
5.	Fluorene	165	1
6.	Dibenzothiophene	184	2
7.	Phenanthrene	178	2
8.	Anthracene	178	2
9.	4H-Cyclopenta[def]phenanthrene	190	2
10.	Fluoranthene	202	2
11.	Pyrene	202	2
12.	Benzo[ghi]fluoranthene	226	3
13.	Benzo[c]phenanthrene	228	3
14.	Benz[a]anthracene	228	3
15.	Cyclopenta[cd]pyrene	226	3
16.	Triphenylene	228	3
17.	Chrysene	228	3
18.	Benzo[b]fluoranthene	252	4
19.	Benzo[k]fluoranthene	252	4
20.	Benzo[j]fluoranthene	252	4
21.	Benzo[a]fluoranthene	252	4
22.	Benzo[e]pyrene	252	4
23.	Benzo[a]pyrene	252	4
24.	Perylene	252	4
25.	Dibenz[a,j]anthracene	278	5
26.	Dibenz[a,c]anthracene	278	5
27.	Indeno[1,2,3-cd]pyrene	276	5
28.	Dibenz[a,h]anthracene	278	5
29.	Benzo[b]chrysene	278	5
30.	Picene	278	5
31.	Benzo[ghi]perylene	276	5
32.	Anthanthrene	276	5
33.	Dibenzo[b,k]fluoranthene	302	6
34.	Dibenzo[a,e]pyrene	302	6
35.	Coronene	300	6
36.	Dibenzo[a,h]pyrene	302	6

Underivatized Cholesterol on Rxi®-5ms

A. Temperature program conditions.

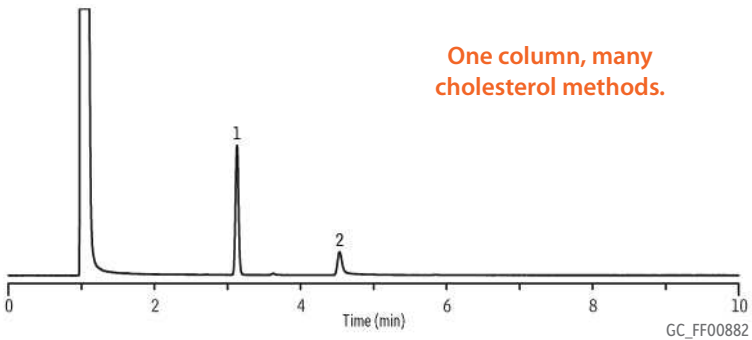
Oven temp.: 200 °C (hold 1 min) to 330 °C @ 20 °C/min (hold 7.5 min)



GC_FF00881

B. Isothermal conditions will maximize sample throughput.

Oven temp.: 300 °C (hold 10 min)



GC_FF00882

One column, many cholesterol methods.

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

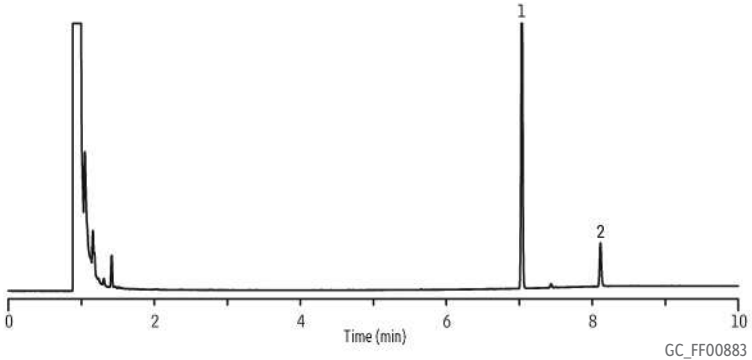
Peaks
1. 5-α-Cholestane (IS)
2. Cholesterol

Column	Rxi® -5ms, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13420)
Sample	1,000 µg/mL cholesterol in DMF 1,000 µg/mL 5-α-cholestane in hexane 25 ng cholesterol, 150 ng 5-α-cholestane on column
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Carrier Gas	He, constant pressure (9.7 psi, 66.9 kPa)
Linear Velocity:	24 cm/sec @ 200 °C
Detector	FID @ 340 °C

Derivatized Cholesterol on Rxi®-5ms

A. Temperature program conditions.

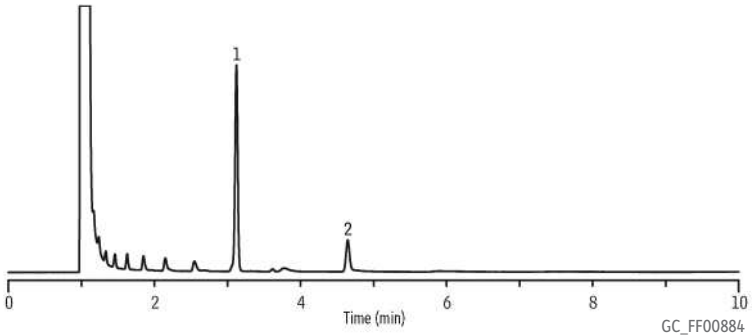
Oven temp.: 200 °C (hold 1 min) to 330 °C @ 20 °C/min (hold 7.5 min)



GC_FF00883

B. Isothermal conditions will maximize sample throughput.

Oven temp.: 300 °C (hold 10 min)



GC_FF00884

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

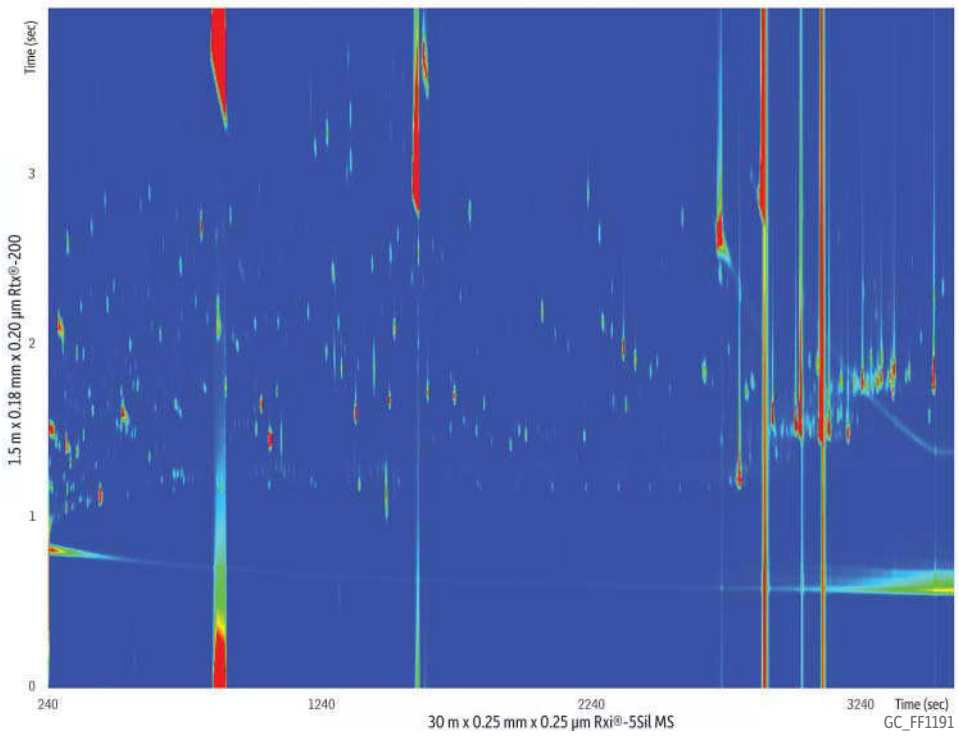
Peaks
1. 5-α-Cholestane (IS)
2. Cholesterol

Column	Rxi®-5ms, 15 m, 0.25 mm ID, 0.25 µm (cat.# 13420)
Sample	1,000 µg/mL cholesterol in hexane 1,000 µg/mL 5-α-cholestane in hexane 50 ng derivatized cholesterol, 150 ng 5-α-cholestane on column
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Carrier Gas	He, constant pressure (9.7 psi, 66.9 kPa)
Linear Velocity:	24 cm/sec @ 200 °C
Detector	FID @ 340 °C

Dietary Supplement (Finished Product) QuEChERS Extract Cleaned with Cartridge SPE (GCxGC-TOFMS Contour Plot)

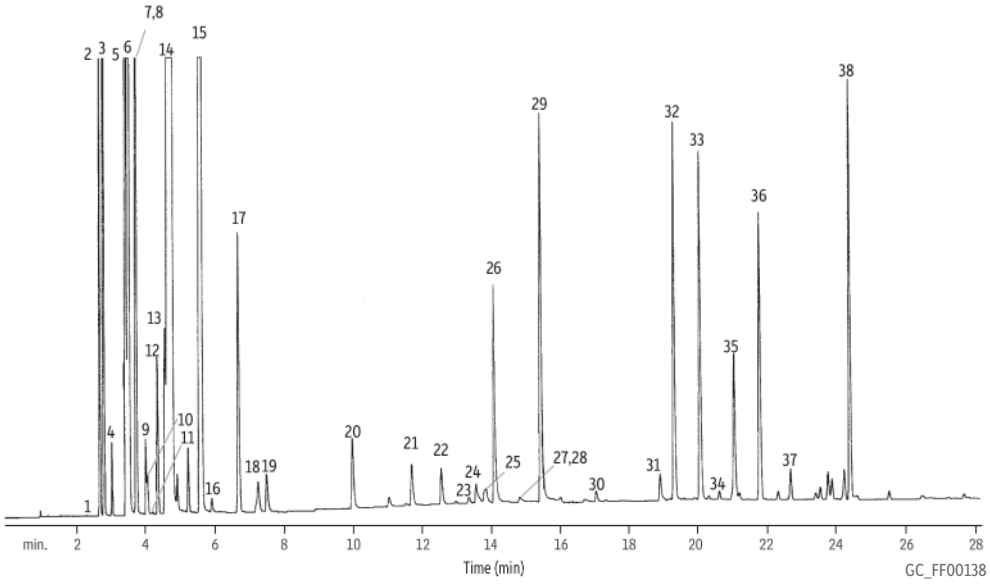
NEW!

GCxGC with orthogonal Rxi®-5Sil MS and Rtx®-200 columns is a powerful way to handle complex samples like dietary supplement extracts.



Column	Rxi®-5Sil MS 30 m, 0.25 mm ID, 0.25 µm (cat.# 13623) Rtx®-200 1.5 m, 0.18 mm ID, 0.20 µm (cat.# 45001)
Sample	
Diluent:	Toluene
Injection	
Inj. Vol.:	1 µL splitless (hold 1 min)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Purge Flow:	40 mL/min
Oven	
Oven Temp:	Rxi®-5Sil MS: 80 °C (hold 1 min) to 310 °C at 4 °C/min (hold 1.5 min) Rtx®-200: 90 °C (hold 1 min) to 320 °C at 4 °C/min (hold 1.5 min)
Carrier Gas	He, constant flow
Flow Rate:	1.8 mL/min
Modulation	
Modulator Temp. Offset:	25 °C
Second Dimension Separation Time:	4 sec
Hot Pulse Time:	1.2 sec
Cool Time between Stages:	0.8 sec
Detector	TOFMS
Transfer Line Temp.:	290 °C
Analyzer Type:	TOF
Source Temp.:	225 °C
Electron Energy:	70 eV
Mass Defect:	-20 mu/100 u
Solvent Delay Time:	4 min
Ionization Mode:	EI
Acquisition Range:	45 to 550 amu
Spectral Acquisition Rate:	100 spectra/sec
Instrument	LECO Pegasus 4D GCxGC-TOFMS
Notes	See application note GNAN1338 for extraction and cleanup details. A 1.5 m length of the Rtx®-200 column was trimmed from a 10 m column. Columns were connected with a universal Press-Tight® connector (cat.# 20429).

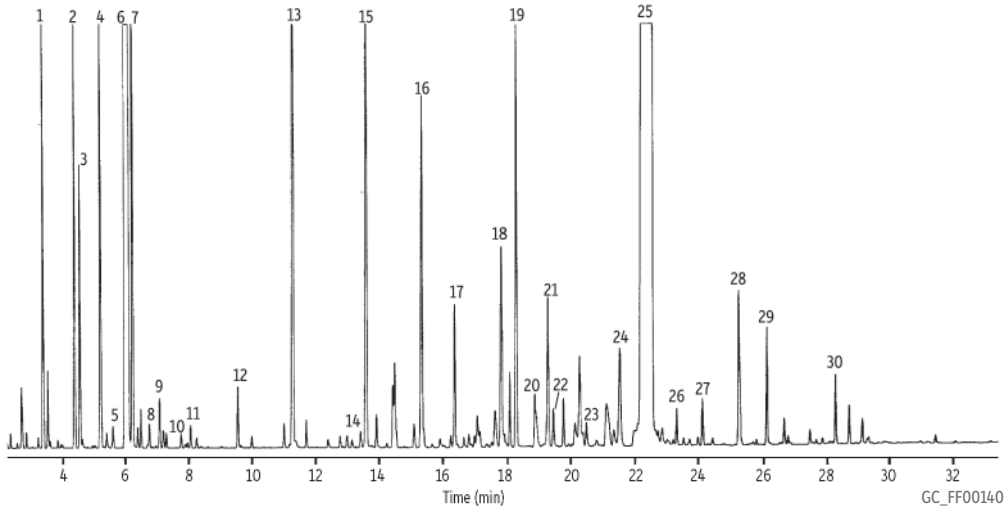
Lemon Oil on Rtx®-5



Column	Rtx®-5, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10224)
Sample	Wet needle split injection of a neat lemon oil
Injection	Split (split ratio 100:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	75 °C (hold 8 min) to 250 °C at 4 °C/min
Carrier Gas	H_2, constant flow
Flow Rate:	3.2 mL/min
Linear Velocity:	40 cm/sec
Detector	FID @ 250 °C
Notes	FID sensitivity: 2 x 10^{-11} AFS

Peaks
1. Heptanol
2. α-Thujene
3. α-Pinene
4. Camphene
5. Sabinene
6. β-Pinene
7. 6-Methyl-5-hepten-2-one
8. Myrcene
9. Octanal
10. α-Phellandrene
11. 3-Carene
12. α-Terpinene
13. *p*-Cymene
14. Limonene
15. γ-Terpinene
16. Octanol
17. Terpinolene
18. Linalool
19. Nonanal
20. Citronellal
21. Terpinene-4-ol
22. α-Terpineol
23. Decanol
24. Octyl acetate
25. Nerol
26. Neral
27. Carvone
28. Geraniol
29. Geranial
30. Nonyl acetate
31. Citronellyl acetate
32. Neryl acetate
33. Geranyl acetate
34. Dodecanal
35. β-Caryophyllene
36. *trans*-α-Bergamotene
37. α-Humulene
38. β-Bisabolene

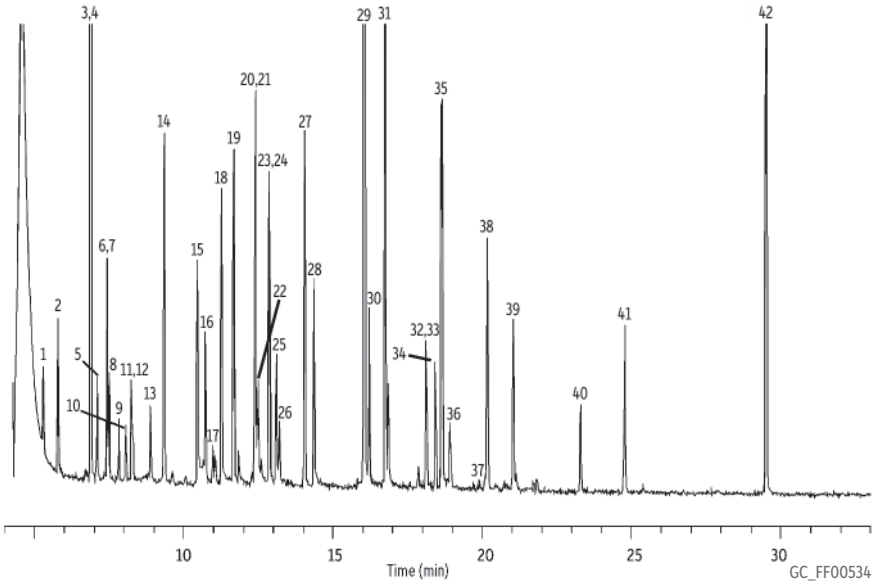
Spearmint Oil (Native) on Stabilwax®



Column	Stabilwax®, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10626)
Sample	Spearmint oil
Conc.:	Neat
Injection	
Inj. Vol.:	0.2 µL split (split ratio 100:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	75 °C (hold 4 min) to 200 °C at 4 °C/min (hold 10 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	40 cm/sec @ 160 °C
Detector	FID @ 250 °C
Notes	FID sensitivity: 4 x 10^{-11} AFS

Peaks
1. α-Pinene
2. β-Pinene
3. Sabinene
4. Myrcene
5. α-Terpinene
6. L-Limonene
7. 1,8-Cineole
8. *cis*-Ocimene
9. γ-Terpinene
10. *p*-Cymene
11. Terpinolene
12. 3-Octyl acetate
13. 3-Octanol
14. l-Menthone
15. *trans*-Sabinenehydrate
16. β-Bourbonene
17. Linalool
18. Terpinene-4-ol
19. β-Caryophyllene
20. Dihydrocarvone
21. *trans*-Dihydrocarvyl acetate
22. *trans*-β-Farnesene
23. α-Terpineol
24. Germacrene-Δ
25. Carvone
26. *cis*-Carvyl acetate
27. *trans*-Carveol
28. *cis*-Carveol
29. *cis*-Jasmone
30. Viridiflorol

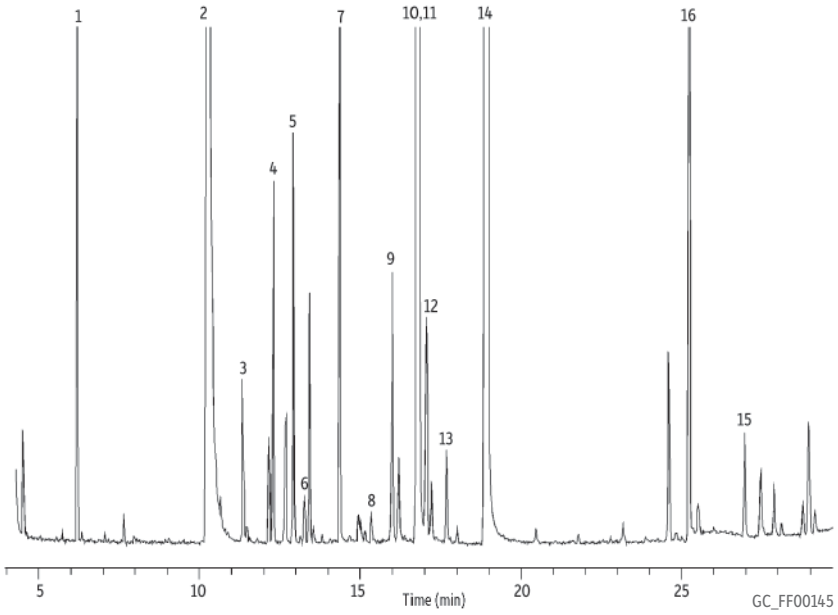
Synthetic Essential Oil Mixture on Rtx®-1



Peaks
1. Ethyl butyrate
2. *trans*-2-Hexenol
3. α-Pinene
4. Benzaldehyde
5. Camphene
6. Octanol
7. β-Myrcene
8. β-Pinene
9. α-Phellandrene
10. *p*-Cymene
11. L-Limonene
12. Camphor
13. *trans*-Sabinene hydrate
14. Linalool
15. Citronellal
16. l-Menthone
17. Menthofuran
18. l-Menthol
19. α-Terpineol
20. Linalyl acetate
21. β-Citronellol
22. Nerol
23. Carveol
24. Anisaldehyde
25. Carvone
26. Geraniol
27. Anethole
28. Cinnamic alcohol
29. Eugenol
30. Neryl acetate
31. Geranyl acetate
32. Vanillin
33. Coumarin
34. α-Ionone
35. Ethyl vanillin
36. β-Caryophyllene
37. α-Caryophyllene
38. β-Ionone
39. Valencene
40. Ethyl laurate
41. Amyl cinnamic aldehyde
42. Nootketone

Column	Rtx®-1, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10126)
Injection	
Inj. Vol.:	1 µL split
Inj. Temp.:	250 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp:	100 °C to 260 °C at 4 °C/min (hold 1 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	30 cm/sec @ 50 °C
Detector	MS
Mode:	Scan
Source Temp.:	280 °C

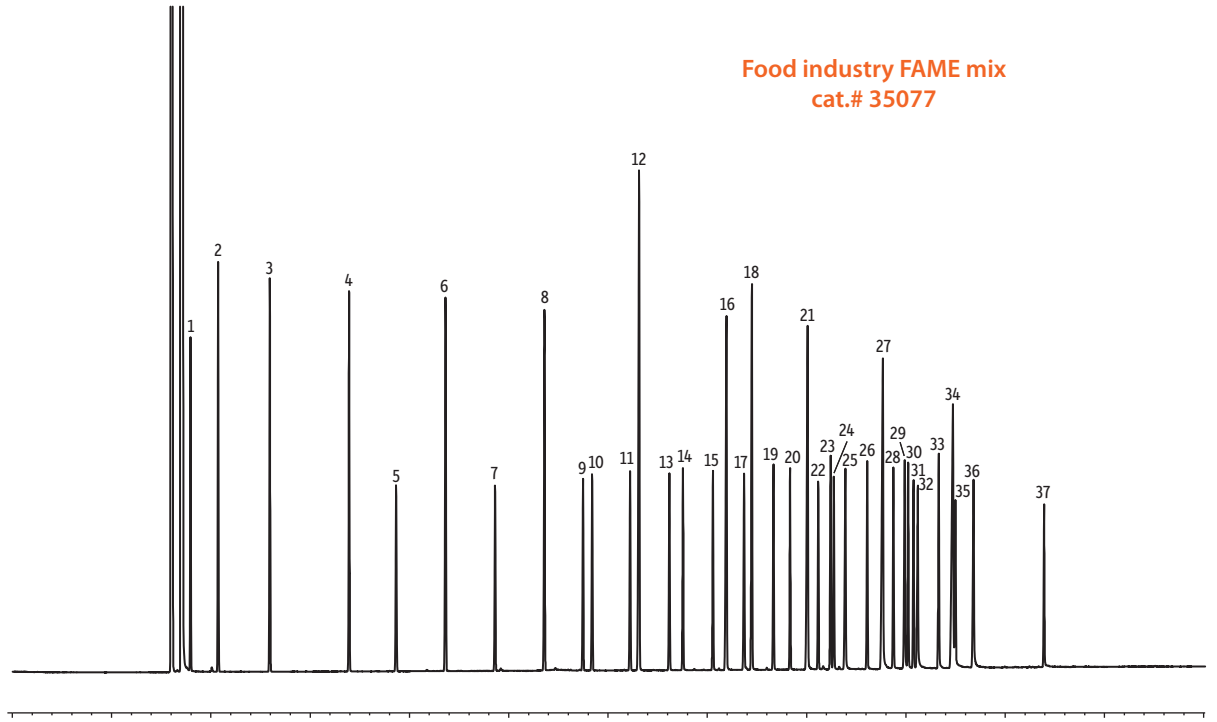
Citronella Java Oil on Stabilwax®



Peaks
1. Limonene
2. Citronellal
3. Linalool
4. Borneol
5. γ-Elemene
6. β-Caryophyllene
7. Neryl acetate
8. α-Terpineol
9. Germancrene-Δ
10. β-Citronellol
11. Geranyl acetate
12. δ-Cadenene
13. Nerol
14. Geraniol
15. Eugenol
16. α-Bergamotene

Column	Stabilwax®, 60 m, 0.25 mm ID, 0.25 µm (cat.# 10626)
Sample	Citronella Java oil
Injection	
Inj. Vol.:	1.0 µL split
Inj. Temp.:	250 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp:	100 °C to 260 °C at 4 °C/min (hold 1 min)
Carrier Gas	He, constant pressure
Linear Velocity:	30 cm/sec @ 50 °C
Detector	MS
Mode:	Scan
Source Temp.:	280 °C

FAMEs (AOAC 996.06 Standard) on Rt®-2560

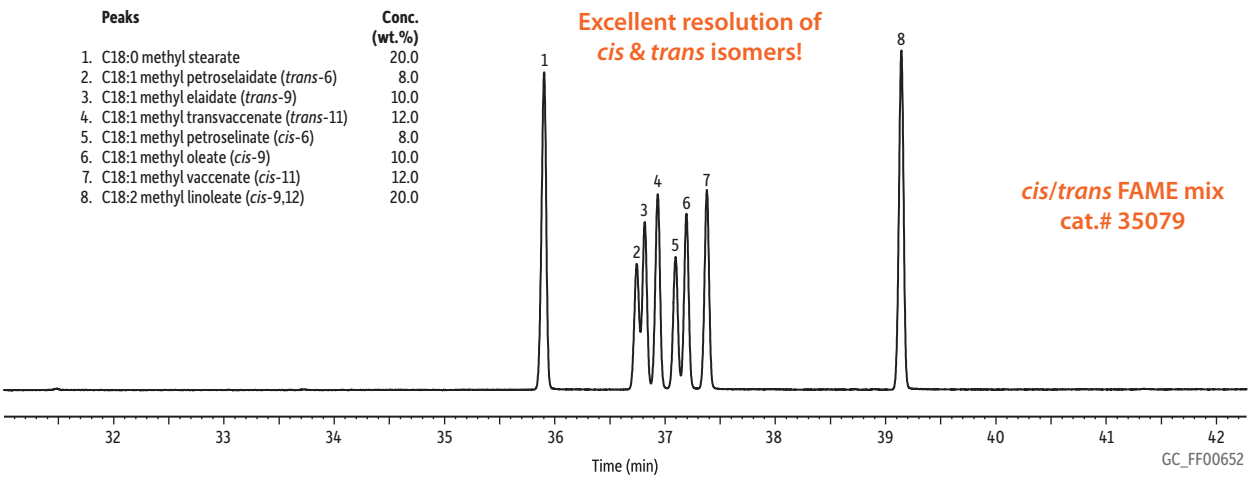


Column	Rt®-2560, 100 m, 0.25 mm ID, 0.20 µm (cat.# 13199)
Sample	Food industry FAME mix (cat.# 35077)
Diluent:	Methylene chloride
Conc.:	30 mg/mL total FAMEs
Injection	
Inj. Vol.:	2.0 µL split (split ratio 200:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	100 °C (hold 4 min) to 240 °C at 3 °C/min (hold 10 min)
Carrier Gas	H_2, constant flow
Flow Rate:	1.2 mL/min
Detector	FID @ 250 °C

	Peaks	% in Mix
1.	C4:0 Methyl butyrate	4.0
2.	C6:0 Methyl hexanoate	4.0
3.	C8:0 Methyl octanoate	4.0
4.	C10:0 Methyl decanoate	4.0
5.	C11:0 Methyl undecanoate	2.0
6.	C12:0 Methyl laurate	4.0
7.	C13:0 Methyl tridecanoate	2.0
8.	C14:0 Methyl myristate	4.0
9.	C14:1 Methyl myristoleate (*cis*-9)	2.0
10.	C15:0 Methyl pentadecanoate	2.0
11.	C15:1 Methyl pentadecenoate (*cis*-10)	2.0
12.	C16:0 Methyl palmitate	6.0
13.	C16:1 Methyl palmitoleate (*cis*-9)	2.0
14.	C17:0 Methyl heptadecanoate	2.0
15.	C17:1 Methyl heptadecenoate (*cis*-10)	2.0
16.	C18:0 Methyl stearate	4.0
17.	C18:1 Methyl elaidate (*trans*-9)	2.0
18.	C18:1 Methyl oleate (*cis*-9)	4.0
19.	C18:2 Methyl linoleaidate (*trans*-9,12)	2.0
20.	C18:2 Methyl linoleate (*cis*-9,12)	2.0
21.	C20:0 Methyl arachidate	4.0
22.	C18:3 Methyl γ-linolenate (*cis*-6,9,12)	2.0
23.	C20:1 Methyl eicosenoate (*cis*-11)	2.0
24.	C18:3 Methyl linolenate (*cis*-9,12,15)	2.0
25.	C21:0 Methyl heneicosanoate	2.0
26.	C20:2 Methyl eicosadienoate (*cis*-11,14)	2.0
27.	C22:0 Methyl behenate	4.0
28.	C20:3 Methyl eicosatrienoate (*cis*-8,11,14)	2.0
29.	C22:1 Methyl erucate (*cis*-13)	2.0
30.	C20:3 Methyl eicosatrienoate (*cis*-11,14,17)	2.0
31.	C20:4 Methyl arachidonate (*cis*-5,8,11,14)	2.0
32.	C23:0 Methyl tricosanoate	2.0
33.	C22:2 Methyl docosadienoate (*cis*-13,16)	2.0
34.	C24:0 Methyl lignocerate	4.0
35.	C20:5 Methyl eicosapentaenoate (*cis*-5,8,11,14,17)	2.0
36.	C24:1 Methyl nervonate (*cis*-15)	2.0
37.	C22:6 Methyl docosahexaenoate (*cis*-4,7,10,13,16,19)	2.0

FAMEs (*cis*/*trans* isomers) on Rt®-2560

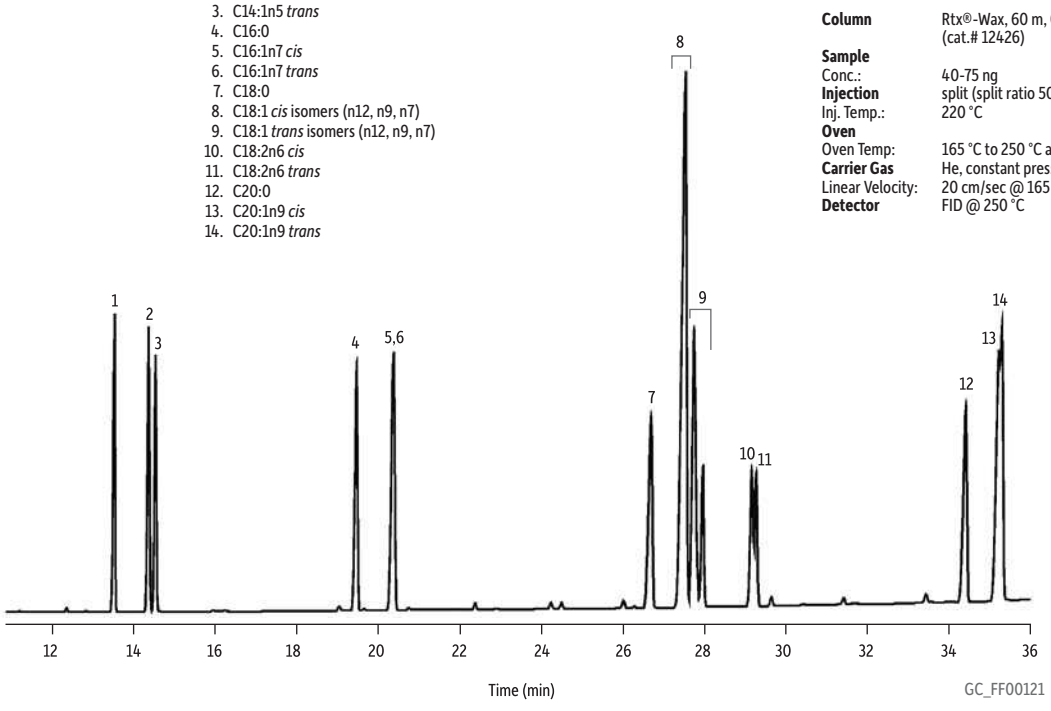
Peaks	Conc. (wt.%)
1. C18:0 methyl stearate	20.0
2. C18:1 methyl petroselaidate (*trans*-6)	8.0
3. C18:1 methyl elaidate (*trans*-9)	10.0
4. C18:1 methyl transvaccenate (*trans*-11)	12.0
5. C18:1 methyl petroselinate (*cis*-6)	8.0
6. C18:1 methyl oleate (*cis*-9)	10.0
7. C18:1 methyl vaccenate (*cis*-11)	12.0
8. C18:2 methyl linoleate (*cis*-9,12)	20.0



Column	Rt®-2560, 100 m, 0.25 mm ID, 0.20 µm (cat.# 13199)
Sample	*cis*/*trans* FAME mix (cat.# 35079)
Diluent:	Methylene chloride
Conc.:	10 mg/mL total FAMEs
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	100 °C (hold 4 min) to 240 °C at 3 °C/min (hold 10 min)
Carrier Gas	H_2, constant flow
Flow Rate:	1.2 mL/min
Detector	FID @ 250 °C

FAMEs (*cis*/*trans* isomers) on Rtx®-Wax

Peaks
1. C14:0
2. C14:1n5 *cis*
3. C14:1n5 *trans*
4. C16:0
5. C16:1n7 *cis*
6. C16:1n7 *trans*
7. C18:0
8. C18:1 *cis* isomers (n12, n9, n7)
9. C18:1 *trans* isomers (n12, n9, n7)
10. C18:2n6 *cis*
11. C18:2n6 *trans*
12. C20:0
13. C20:1n9 *cis*
14. C20:1n9 *trans*



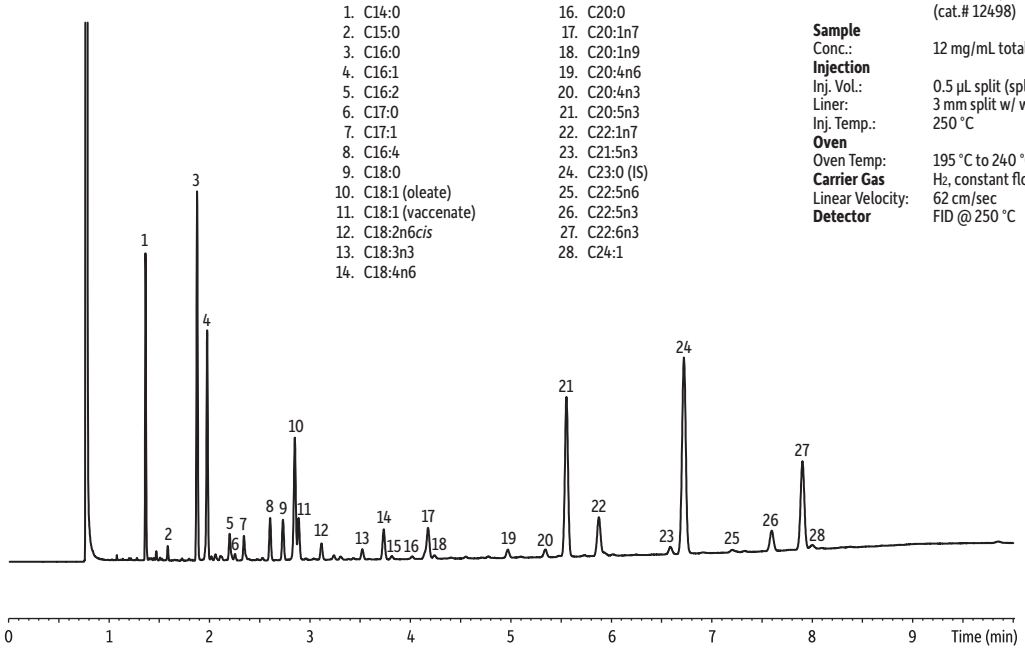
Column	Rtx®-Wax, 60 m, 0.25 mm ID, 0.25 µm (cat.# 12426)
Sample	
Conc.:	40-75 ng
Injection	split (split ratio 50:1)
Inj. Temp.:	220 °C
Oven	
Oven Temp:	165 °C to 250 °C at 2 °C/min
Carrier Gas	He, constant pressure
Linear Velocity:	20 cm/sec @ 165 °C
Detector	FID @ 250 °C

FAMEs (Marine Oil Standard) on FAMEWAX

FAST analysis of marine oil FAMEs!

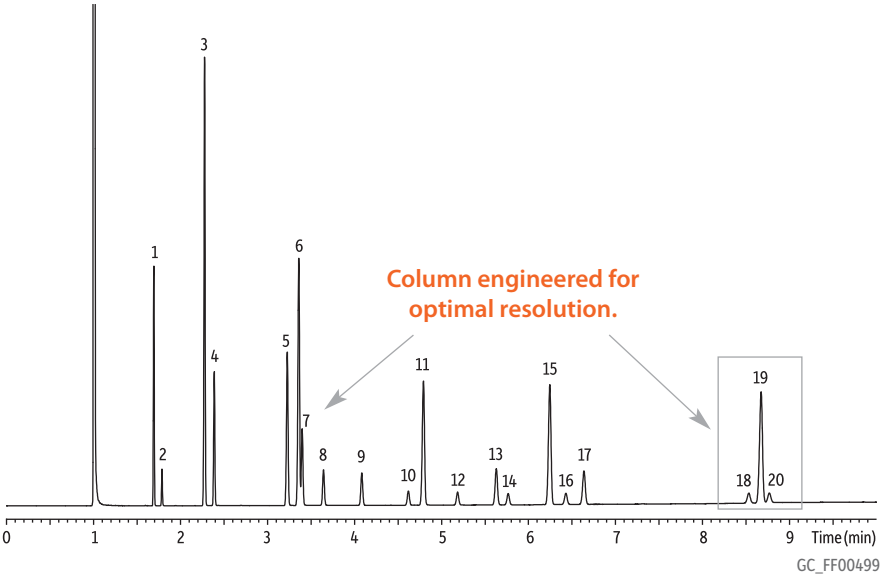
Peaks	
1.	C14:0
2.	C15:0
3.	C16:0
4.	C16:1
5.	C16:2
6.	C17:0
7.	C17:1
8.	C16:4
9.	C18:0
10.	C18:1 (oleate)
11.	C18:1 (vaccenate)
12.	C18:2n6*cis*
13.	C18:3n3
14.	C18:4n6
15.	C18:4n3
16.	C20:0
17.	C20:1n7
18.	C20:1n9
19.	C20:4n6
20.	C20:4n3
21.	C20:5n3
22.	C22:1n7
23.	C21:5n3
24.	C23:0 (IS)
25.	C22:5n6
26.	C22:5n3
27.	C22:6n3
28.	C24:1

Column	FAMEWAX, 30 m, 0.32 mm ID, 0.25 µm (cat.# 12498)
Sample	
Conc.:	12 mg/mL total FAMEs
Injection	
Inj. Vol.:	0.5 µL split (split ratio 150:1)
Liner:	3 mm split w/ wool (cat.# 20936-202.1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	195 °C to 240 °C at 5 °C/min (hold 1 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	62 cm/sec
Detector	FID @ 250 °C



GC_FF00568

FAMEs (Marine Oil Standard) on FAMEWAX

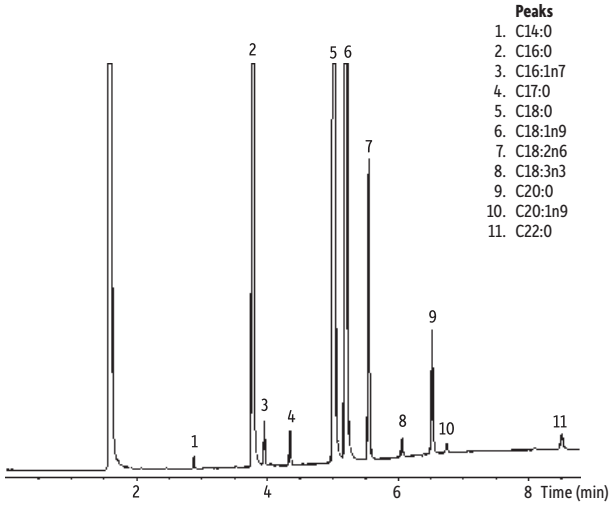


GC_FF00499

Peaks		Conc. (µg/mL)
1.	C14:0	600
2.	C14:1	100
3.	C16:0	1,600
4.	C16:1	500
5.	C18:0	800
6.	C18:1 (oleate)	1,300
7.	C18:1 (vaccenate)	400
8.	C18:2	200
9.	C18:3	200
10.	C20:0	100
11.	C20:1	900
12.	C20:2	100
13.	C20:4	300
14.	C20:3	100
15.	C20:5	1,000
16.	C22:0	100
17.	C22:1	300
18.	C24:0	100
19.	C22:6	1,200
20.	C24:1	100

Column	FAMEWAX, 30 m, 0.32 mm ID, 0.25 µm (cat.# 12498)
Sample	Marine oil FAME mix (cat.# 35066)
Diluent:	Isooctane
Conc.:	10,000 µg/mL (total FAMEs; see breakdown in peak list)
Injection	
Inj. Vol.:	1 µL split (split ratio 100:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	195 °C to 240 °C at 5 °C/min (hold 1 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Detector	FID @ 275 °C

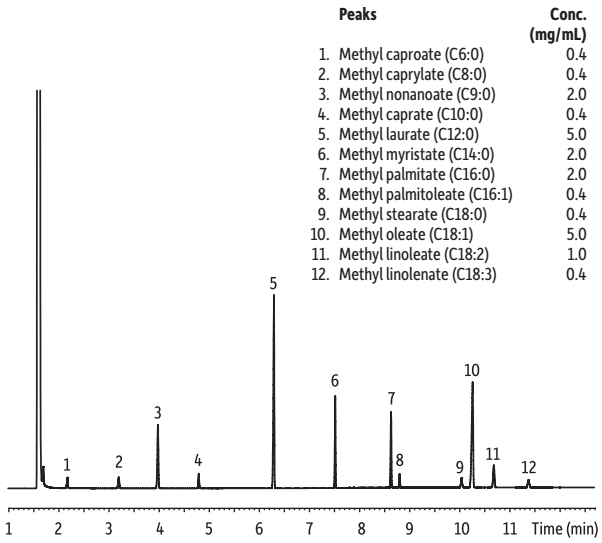
FAMEs (Cocoa Butter) on Stabilwax®



GC_FF00120

Column	Stabilwax®, 30 m, 0.25 mm ID, 0.25 µm (cat.# 10623)
Sample	FAME reference standard for cocoa butter
Injection	
Inj. Vol.:	1.0 µL split (split ratio 45:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	200 °C to 250 °C at 8 °C/min (hold 3 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	31.4 cm/sec @ 200 °C
Detector	FID @ 250 °C
Notes	FID sensitivity: 8 x 10^{-11} AFS

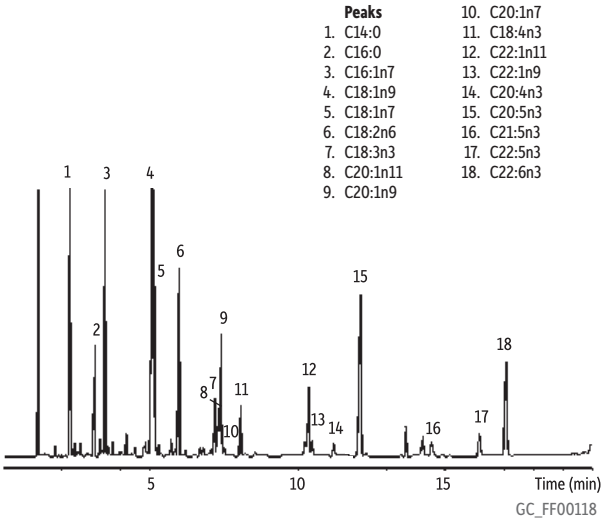
FAMEs (Saw Palmetto) on Rtx®-Wax



GC_FF00538

Column	Rtx®-Wax, 30 m, 0.25 mm ID, 0.25 µm (cat.# 12423)
Sample	Saw palmetto standard
Conc.:	See peak list
Injection	
Inj. Vol.:	1 µL split (split ratio 100:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	120 °C (hold 3 min) to 220 °C at 20 °C/min (hold 12 min)
Carrier Gas	He, constant flow
Flow Rate:	1 mL/min
Linear Velocity:	34 cm/sec
Detector	FID @ 300 °C

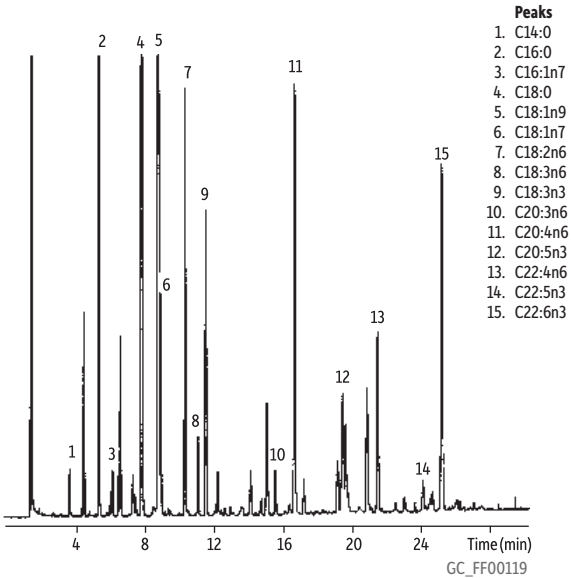
FAMEs (PUFA, Marine Source) on Rt®-2330



GC_FF00118

Column	Rt®-2330, 30 m, 0.25 mm ID, 0.20 µm (cat.# 10723)
Sample	PUFA mix
Injection	
Inj. Vol.:	0.5 µL split (split ratio 35:1)
Inj. Temp.:	225 °C
Oven	
Oven Temp:	160 °C to 225 °C at 2 °C/min
Carrier Gas	H_2, constant pressure
Linear Velocity:	45 cm/sec @ 160 °C
Detector	FID @ 250 °C
Notes	FID sensitivity: 8 x 10^{-11} AFS

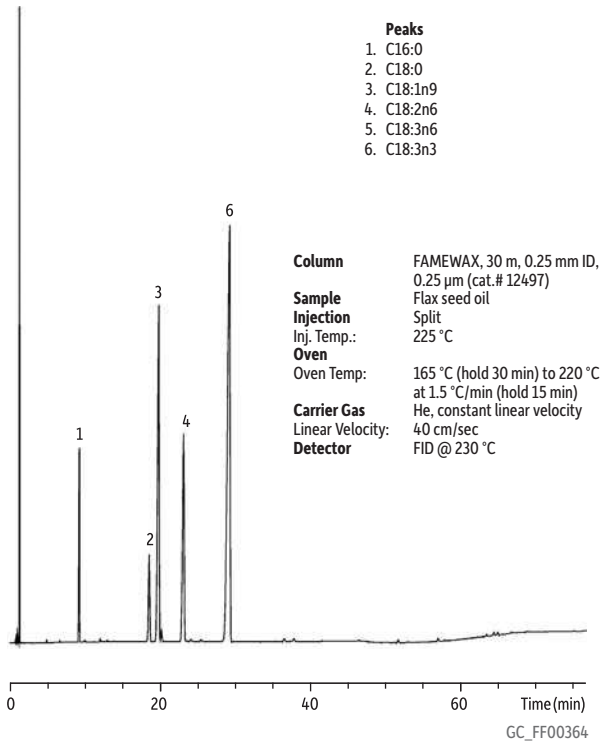
FAMEs (Polyunsaturated Fatty Acids, Animal Source) on Rt®-2330



GC_FF00119

Column	Rt®-2330, 30 m, 0.32 mm ID, 0.20 µm (cat.# 10724)
Sample	PUFA 2 mix
Injection	
Inj. Vol.:	0.1 µL split (split ratio 20:1)
Inj. Temp.:	260 °C
Oven	
Oven Temp:	160 °C to 250 °C at 2 °C/min (hold 10 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	40 cm/sec
Detector	FID @ 260 °C
Notes	FID sensitivity: 8 x 10^{-11} AFS

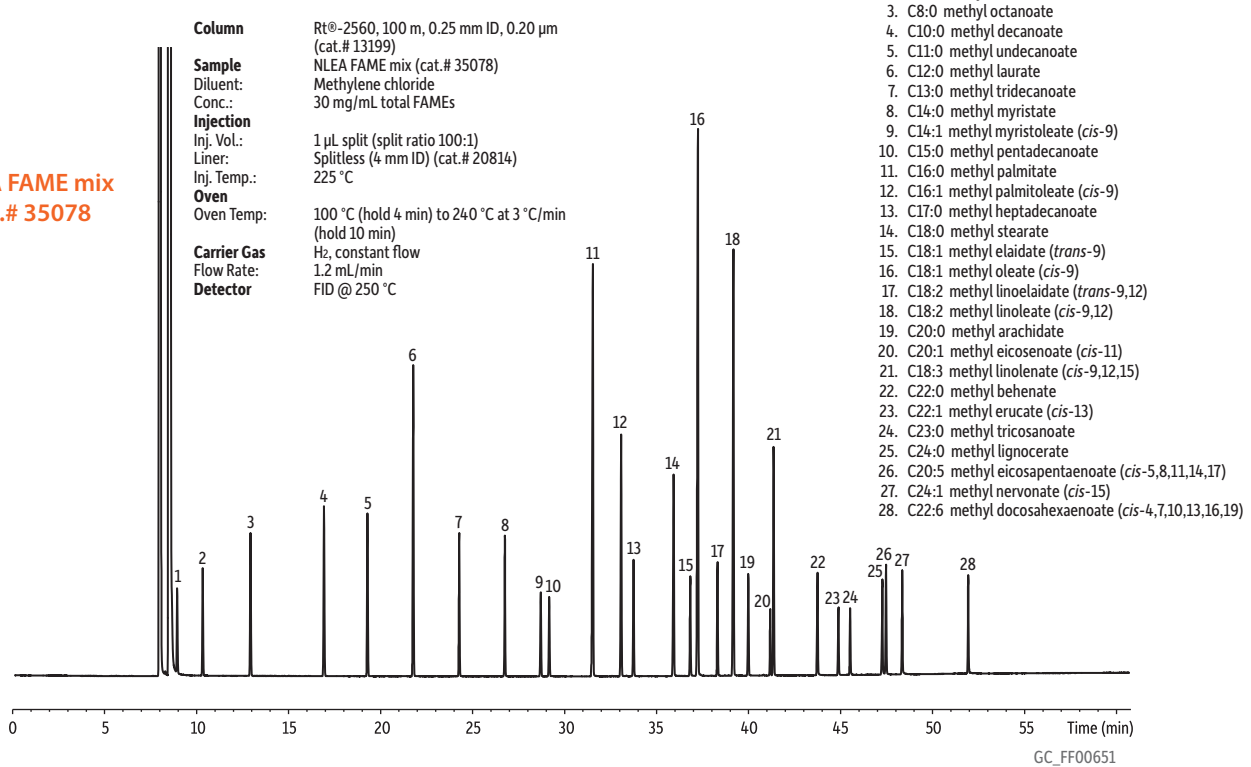
FAMEs (Flax Seed Oil) on FAMEWAX



FAMEs (NLEA Mix) on Rt®-2560

An Rt®-2560 column provides the resolution of *cis* & *trans* FAMEs needed for AOAC Method 996.06.

NLEA FAME mix
cat.# 35078

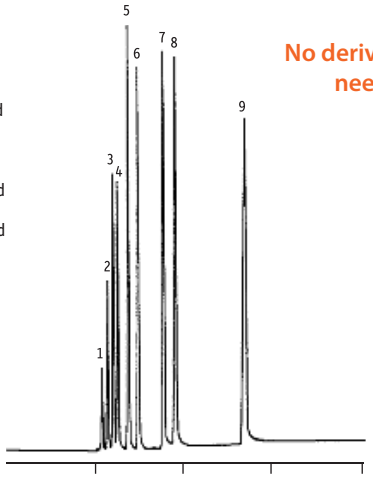


Peaks
1. C4:0 methyl butyrate
2. C6:0 methyl hexanoate
3. C8:0 methyl octanoate
4. C10:0 methyl decanoate
5. C11:0 methyl undecanoate
6. C12:0 methyl laurate
7. C13:0 methyl tridecanoate
8. C14:0 methyl myristate
9. C14:1 methyl myristoleate (*cis*-9)
10. C15:0 methyl pentadecanoate
11. C16:0 methyl palmitate
12. C16:1 methyl palmitoleate (*cis*-9)
13. C17:0 methyl heptadecanoate
14. C18:0 methyl stearate
15. C18:1 methyl elaidate (*trans*-9)
16. C18:1 methyl oleate (*cis*-9)
17. C18:2 methyl linoelaidate (*trans*-9,12)
18. C18:2 methyl linoleate (*cis*-9,12)
19. C20:0 methyl arachidate
20. C20:1 methyl eicosenoate (*cis*-11)
21. C18:3 methyl linolenate (*cis*-9,12,15)
22. C22:0 methyl behenate
23. C22:1 methyl erucate (*cis*-13)
24. C23:0 methyl tricosanoate
25. C24:0 methyl lignocerate
26. C20:5 methyl eicosapentaenoate (*cis*-5,8,11,14,17)
27. C24:1 methyl nervonate (*cis*-15)
28. C22:6 methyl docosahexaenoate (*cis*-4,7,10,13,16,19)

Fatty Acids (Free) on Rtx®-200

Peaks
1. Acetic acid
2. Propionic acid
3. Isobutyric acid
4. *n*-Butyric acid
5. Isovaleric acid
6. *n*-Valeric acid
7. Isocaproic acid
8. Caproic acid
9. Heptanoic acid

No derivatization needed!



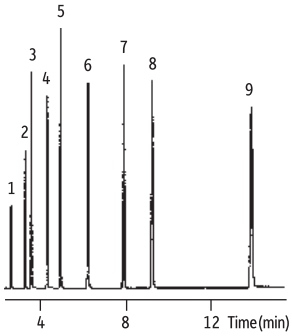
GC_CH00282

Column	Rtx®-200, 30 m, 0.25 mm ID, 0.25 µm (cat.# 15023)
Sample	Free fatty acid standard
Conc.:	~10-20 ng/µL
Injection	
Inj. Vol.:	0.8 µL split
Inj. Temp.:	250 °C
Split Vent Flow Rate:	40 mL/min
Oven	
Oven Temp:	90 °C
Carrier Gas	H_2, constant flow
Flow Rate:	1.4 mL/min
Linear Velocity:	40 cm/sec
Detector	FID @ 250 °C
Notes	FID sensitivity: 4 x 10^{-11} AFS

Fatty Acids (Free) on Stabilwax®-DA (30 m, 0.25 mm ID, 0.25 µm)

Peaks
1. Acetic acid
2. Propionic acid
3. Isobutyric acid
4. *n*-Butyric acid
5. Isovaleric acid
6. *n*-Valeric acid
7. Isocaproic acid
8. Caproic acid
9. Heptanoic acid

No derivatization needed!



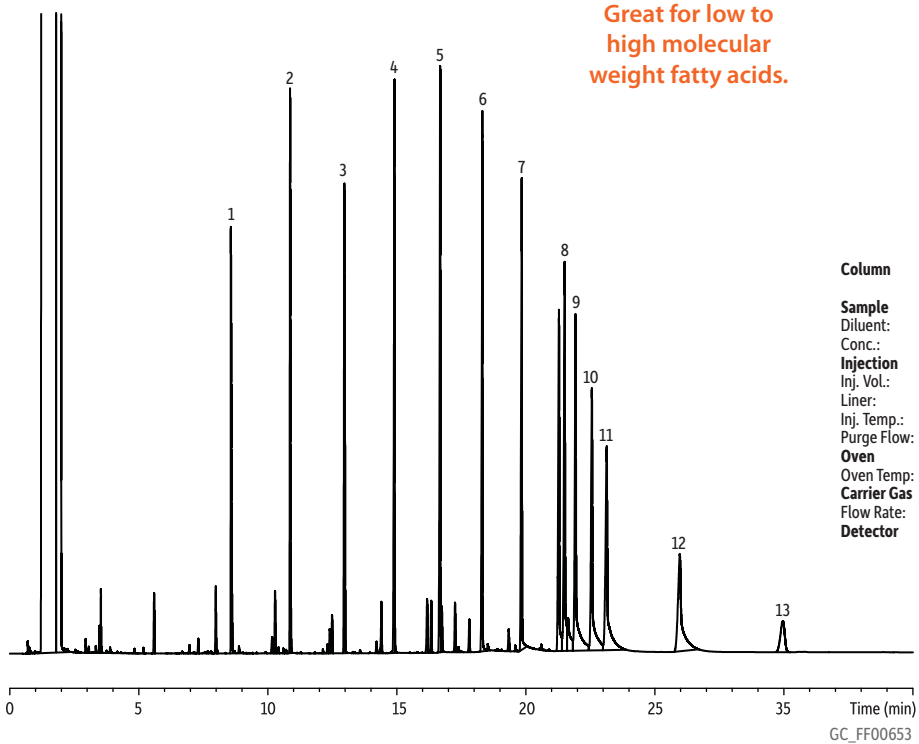
GC_CH00280

Column	Stabilwax®-DA, 30 m, 0.25 mm ID, 0.25 µm (cat.# 11023)
Sample	Free acid standard
Conc.:	~10-20 ng/µL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 50:1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	145 °C
Carrier Gas	H_2, constant pressure
Linear Velocity:	40 cm/sec
Detector	FID @ 250 °C
Notes	FID sensitivity: 2 x 10^{-11} AFS

Fatty Acids (Free) on Stabilwax®-DA (30 m, 0.32 mm ID, 0.25 µm)

Great for low to high molecular weight fatty acids.

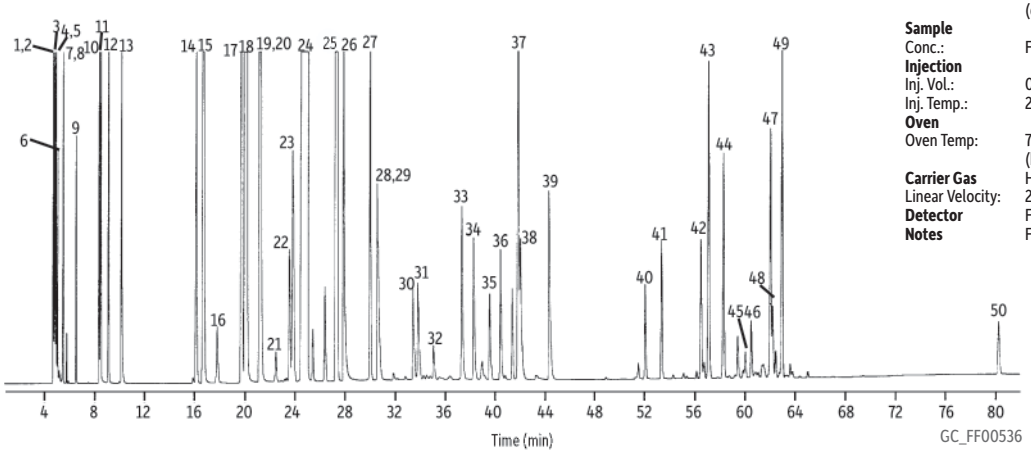
Peaks
1. C4:0 Butyric acid
2. C6:0 Caproic acid
3. C8:0 Caprylic acid
4. C10:0 Capric acid
5. C12:0 Lauric acid
6. C14:0 Myristic acid
7. C16:0 Palmitic acid
8. C18:0 Stearic acid
9. C18:1 Oleic acid
10. C18:2 Linoleic acid
11. C18:3 Linolenic acid
12. C20:0 Arachidic acid
13. C22:0 Behenic acid



GC_FF00653

Column	Stabilwax®-DA, 30 m, 0.32 mm ID, 0.25 µm (cat.# 11024)
Sample	Free fatty acid mix
Diluent:	Methanol
Conc.:	100 ppm
Injection	
Inj. Vol.:	1 µL splitless (hold 0.25 min)
Liner:	Laminar cup splitter
Inj. Temp.:	250 °C
Purge Flow:	75 mL/min
Oven	
Oven Temp:	40 °C to 250 °C at 10 °C/min (hold 15 min)
Carrier Gas	H_2, constant flow
Flow Rate:	6 mL/min
Detector	FID @ 250 °C

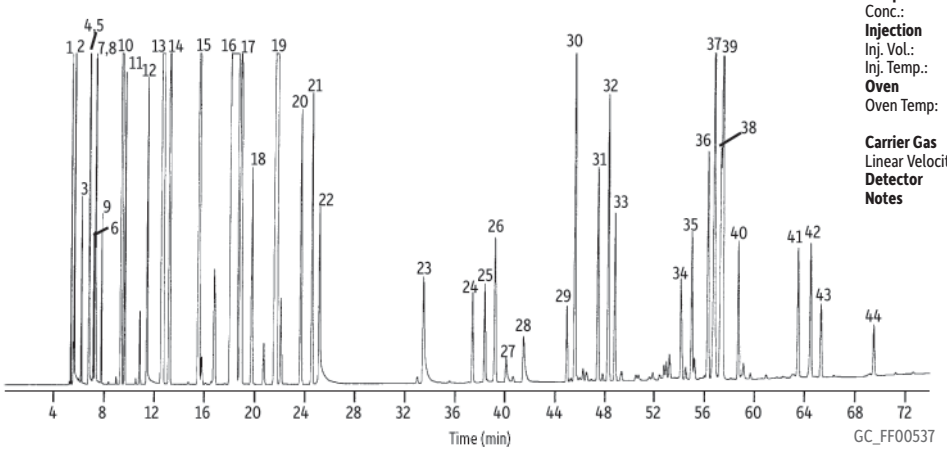
Flavor Volatiles on Rtx®-1



Column	Rtx®-1, 60 m, 0.53 mm ID, 0.50 µm (cat.# 10143)
Sample	
Conc.:	Flavor volatiles test mix
Injection	
Inj. Vol.:	0.8 µL split (split ratio 20:1)
Inj. Temp.:	220 °C
Oven	
Oven Temp:	70 °C (hold 15 min) to 190 °C at 2 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	20 cm/sec @ 70 °C
Detector	FID @ 260 °C
Notes	FID Sensitivity: 64 x 10^{-11} AFS

Peaks
1. Methanol
2. Acetaldehyde
3. Ethanol
4. Acetone
5. Isopropyl alcohol
6. Methylene chloride
7. Hexane
8. Ethyl acetate
9. Ethyl propionate
10. *n*-Hexanal
11. Ethyl butyrate
12. Furfural
13. *trans*-2-Hexenal
14. α-Thujene
15. α-Pinene
16. Camphene
17. Sabinene
18. β-Pinene
19. Octanal
20. Myrcene
21. α-Phellandrene
22. α-Terpinene
23. *p*-Cymene
24. δ-Limonene
25. γ-Terpinene
26. Octanol
27. Terpinolene
28. Nonanal
29. Linalool
30. *cis*-Limonene monoxide
31. *trans*-Limonene monoxide
32. Citronellal
33. Terpinene-4-ol
34. α-Terpineol
35. Decanal
36. d/l Carveol
37. Neral
38. Carvone
39. Geranial
40. Neryl acetate
41. Geranyl acetate
42. α-Ionone
43. β-Caryophyllene
44. *trans*-α-Bergamotene
45. BHA
46. β-Ionone
47. Valencene
48. γ-Elemene
49. β-Bisabolene
50. Nootketone

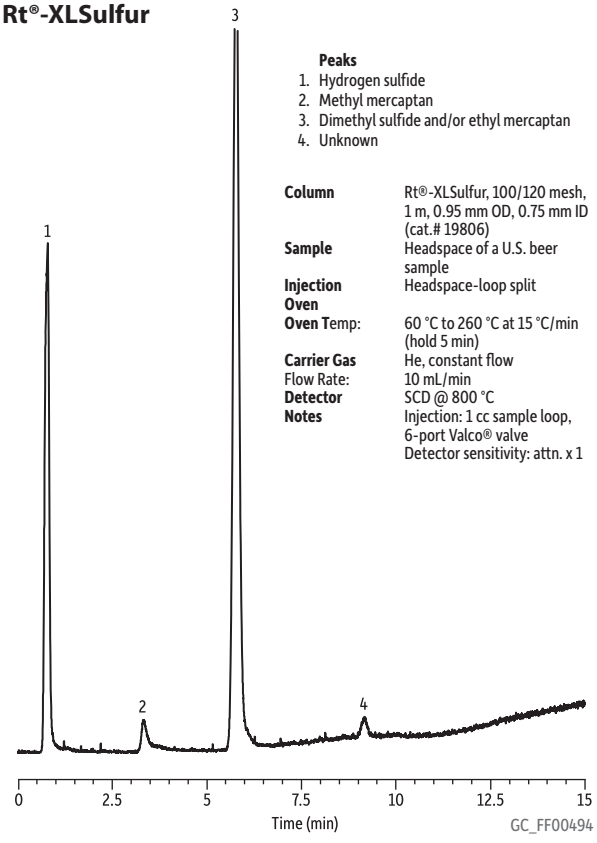
Flavor Volatiles on Stabilwax®



Column	Stabilwax®, 60 m, 0.53 mm ID, 0.50 µm (cat.# 10643)
Sample	
Conc.:	Flavor volatiles test mix
Injection	
Inj. Vol.:	0.8 µL split (split ratio 20:1)
Inj. Temp.:	220 °C
Oven	
Oven Temp:	70 °C (hold 15 min) to 190 °C at 2 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	20 cm/sec @ 70 °C
Detector	FID @ 260 °C
Notes	FID Sensitivity: 64 x 10^{-11} AFS

Peaks
1. Hexane
2. Acetaldehyde
3. Acetone
4. Methanol
5. Ethyl acetate
6. Isopropyl alcohol
7. Ethanol
8. Methylene chloride
9. Ethyl propionate
10. α-Pinene
11. Ethylbutyrate
12. *n*-Hexanal
13. β-Pinene
14. Sabinene
15. Myrcene
16. δ-Limonene
17. 1,8-Cineole
18. *trans*-2-Hexenal
19. γ-Terpinene
20. *p*-Cymene
21. Terpinolene
22. Octanal
23. Nonanal
24. *cis*-Limonene monoxidec
25. *trans*-Limonene
26. Furfural
27. Citronellal
28. Decanal
29. Linalool
30. Octanol
31. *trans*-α-Bergamotene
32. β-Caryophyllene
33. Terpinene-4-ol
34. Neral
35. α-Terpineol
36. Neryl acetate
37. Valencene
38. Geranial
39. Carvone
40. Geranyl acetate
41. d/l Carveol
42. α-Ionone
43. d/l Carveol
44. β-Ionone

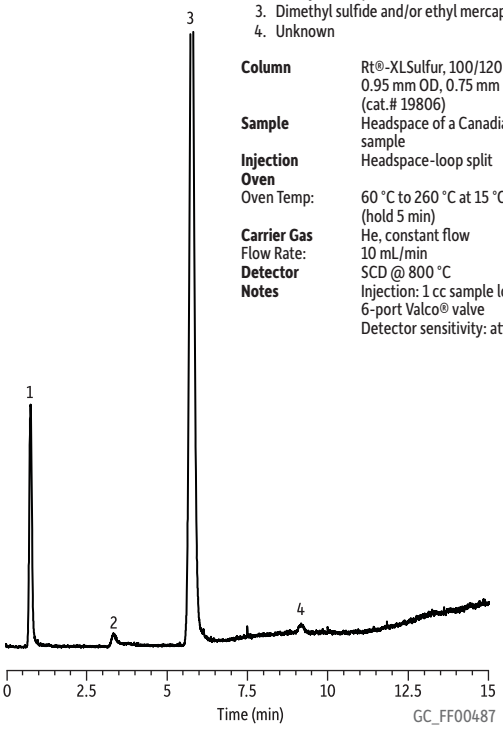
Sulfur Compounds in Headspace Sample of U.S. Beer on Rt®-XLSulfur



Peaks
1. Hydrogen sulfide
2. Methyl mercaptan
3. Dimethyl sulfide and/or ethyl mercaptan
4. Unknown

Column	Rt®-XLSulfur, 100/120 mesh, 1 m, 0.95 mm OD, 0.75 mm ID (cat.# 19806)
Sample	Headspace of a U.S. beer sample
Injection	Headspace-loop split
Oven	
Oven Temp:	60 °C to 260 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	SCD @ 800 °C
Notes	Injection: 1 cc sample loop, 6-port Valco® valve Detector sensitivity: attn. x 1

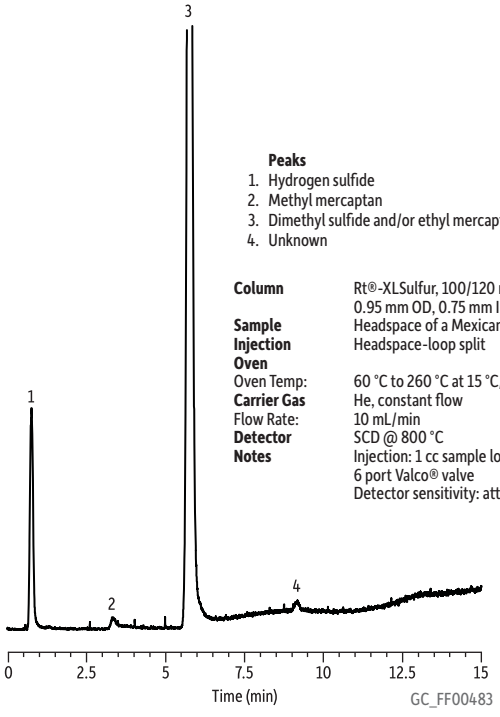
Sulfur Compounds in Headspace Sample of Canadian Beer on Rt®-XLSulfur



Peaks
1. Hydrogen sulfide
2. Methyl mercaptan
3. Dimethyl sulfide and/or ethyl mercaptan
4. Unknown

Column	Rt®-XLSulfur, 100/120 mesh, 1 m, 0.95 mm OD, 0.75 mm ID (cat.# 19806)
Sample	Headspace of a Canadian beer sample
Injection	Headspace-loop split
Oven	
Oven Temp:	60 °C to 260 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	SCD @ 800 °C
Notes	Injection: 1 cc sample loop, 6-port Valco® valve Detector sensitivity: attn. x 1

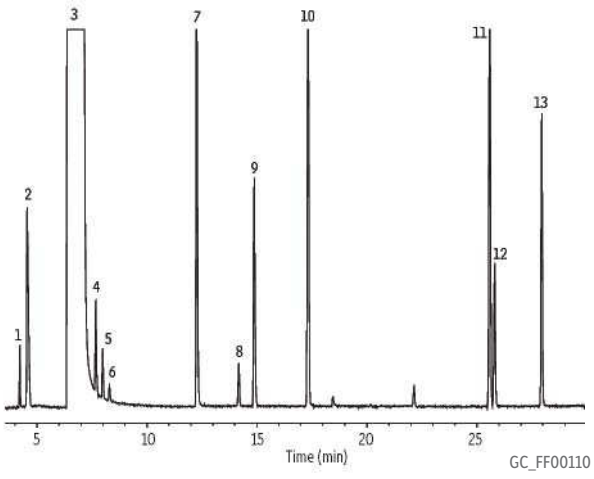
Sulfur Compounds in Headspace Sample of Mexican Beer on Rt®-XLSulfur



Peaks
1. Hydrogen sulfide
2. Methyl mercaptan
3. Dimethyl sulfide and/or ethyl mercaptan
4. Unknown

Column	Rt®-XLSulfur, 100/120 mesh, 1 m, 0.95 mm OD, 0.75 mm ID (cat.# 19806)
Sample	Headspace of a Mexican beer sample
Injection	Headspace-loop split
Oven	
Oven Temp:	60 °C to 260 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	SCD @ 800 °C
Notes	Injection: 1 cc sample loop, 6 port Valco® valve Detector sensitivity: attn. x 1

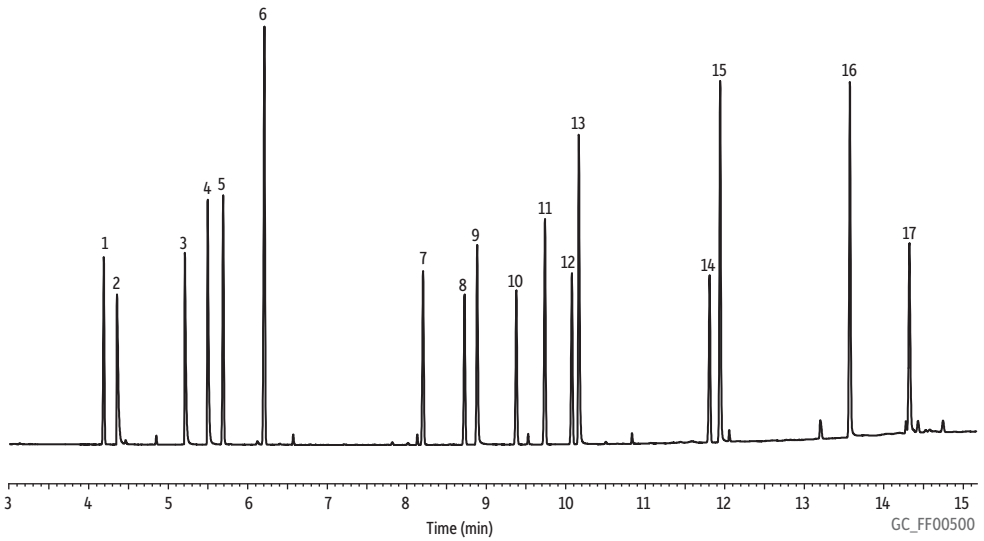
Rum on Rtx®-1301



Column	Rtx®-1301, 60 m, 0.25 mm ID, 1.40 µm (cat.# 16016)
Sample	
Conc.:	Neat
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Cyclosplitter® (cat.# 20706)
Inj. Temp.:	150 °C
Oven	
Oven Temp:	35 °C (hold 5 min) to 100 °C at 1 °C/min
Carrier Gas	H_2, constant pressure
Linear Velocity:	40 cm/sec
Detector	FID @ 200 °C

Peaks
1. Acetaldehyde
2. Methanol
3. Ethanol
4. Acetone
5. Ethyl formate
6. Isopropanol
7. *n*-Propanol
8. Ethyl acetate
9. *sec*-Butanol
10. Isobutanol
11. Isoamyl alcohol
12. Active amyl alcohol
13. *n*-Amyl alcohol

Underivatized Alcoholic Beverage Acids and Methyl Esters on Stabilwax®-DA

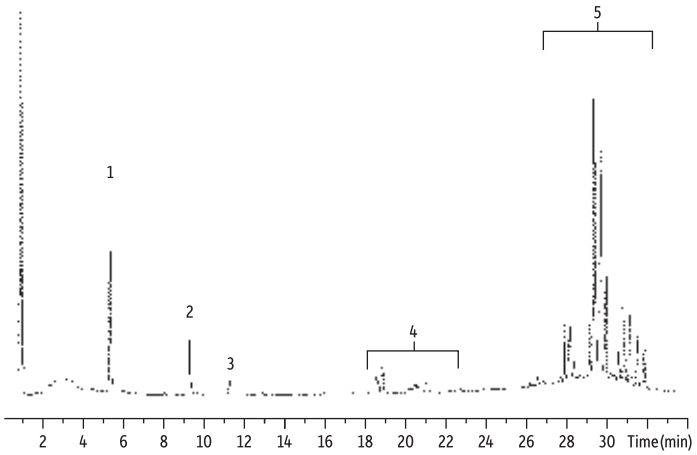


Peaks	Conc. (µg/mL)
1. Ethyl octanoate	100
2. Acetic acid	100
3. Propionic acid	100
4. Isobutyric acid	100
5. 3-Decanol	50
6. Ethyl decanoate	50
7. Ethyl laurate	50
8. *cis*-Lactone	100
9. 2-Phenylethanol	50
10. *trans*-Lactone	100
11. Methyl myristate	50
12. Ethyl myristate	50
13. Octanoic acid	100
14. Ethyl palmitate	50
15. Decanoic acid	100
16. Dodecanoic acid	100
17. Vanillin	100

Column	Stabilwax®-DA, 30 m, 0.18 mm ID, 0.18 µm (cat.# 550752)
Sample	
Diluent:	Ethyl acetate
Injection	
Inj. Vol.:	1 µL splitless (hold 0.5 min)
Liner:	Splitless (4 mm ID) w/glass wool (cat.# 20814-202.1)
Inj. Temp.:	240 °C
Oven	
Oven Temp:	70 °C to 240 °C at 12 °C/min (hold 3 min)
Carrier Gas	H_2, constant linear velocity
Linear Velocity:	28 psi, 193.1 kPa @ 240 °C
Detector	FID
Make-up Gas Type:	N_2

Egg Pasta Sterols & Glycerides on Rtx®-65TG

Peaks
1. Squalene (IS)
2. Cholesterol
3. β-Sitosterol
4. Diglycerides
5. Triglycerides



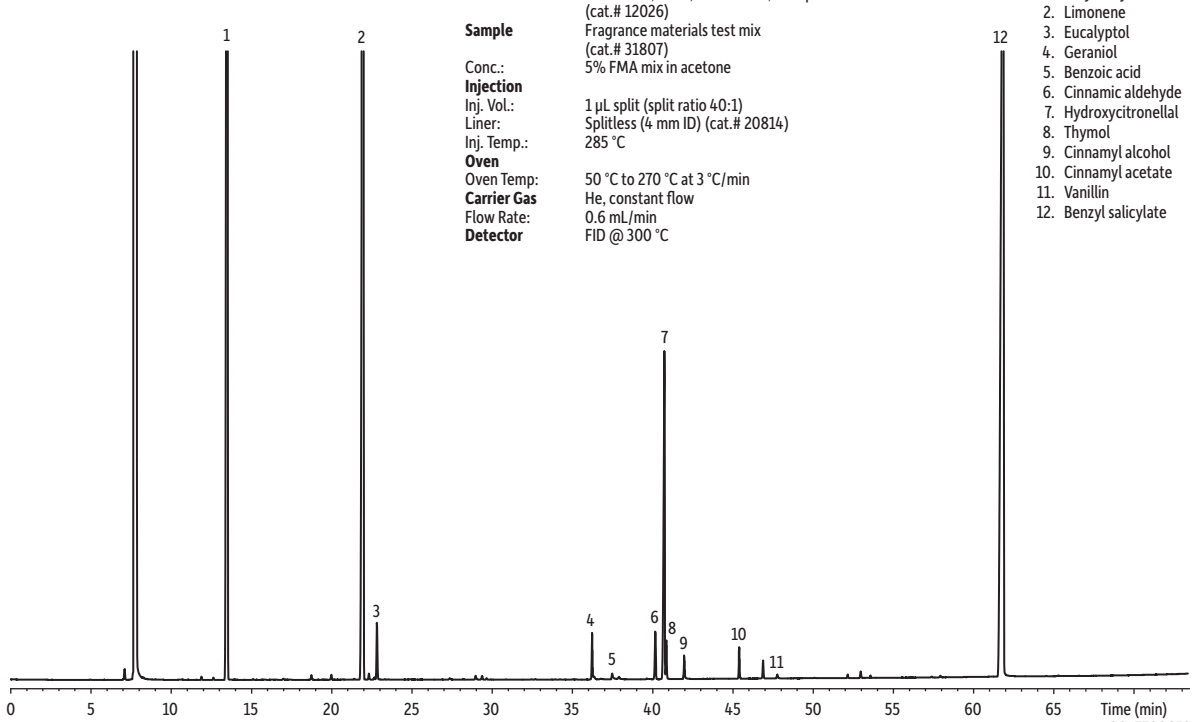
GC_FF01046

Column	Rtx®-65TG, 30 m, 0.25 mm ID, 0.10 µm (cat.# 17008)
Sample	Fat extract from egg pasta in diethyl ether solution with 3,000 ppm squalene (IS)
Conc.:	50 µg/mL
Injection	
Inj. Vol.:	0.5 µL ptv split (split ratio 80:1)
Inlet Temp. Program:	70 °C (hold 12 min) to 370 °C at 99 °C/min (hold 5 min)
Oven	
Oven Temp:	220 °C (hold 2 min) to 360 °C at 5 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	1.5 mL/min
Detector	FID @ 370 °C
Acknowledgement	Daniele Naviglio, Fabiana Pizzolongo; Dipartimento di Scienza degli Alimenti – Università degli Studi di Napoli "Federico II" – Via Università, 100 - 80055 Portici (NA) – Italia

5% Fragrance Materials Association Mix on Rtx®-1701

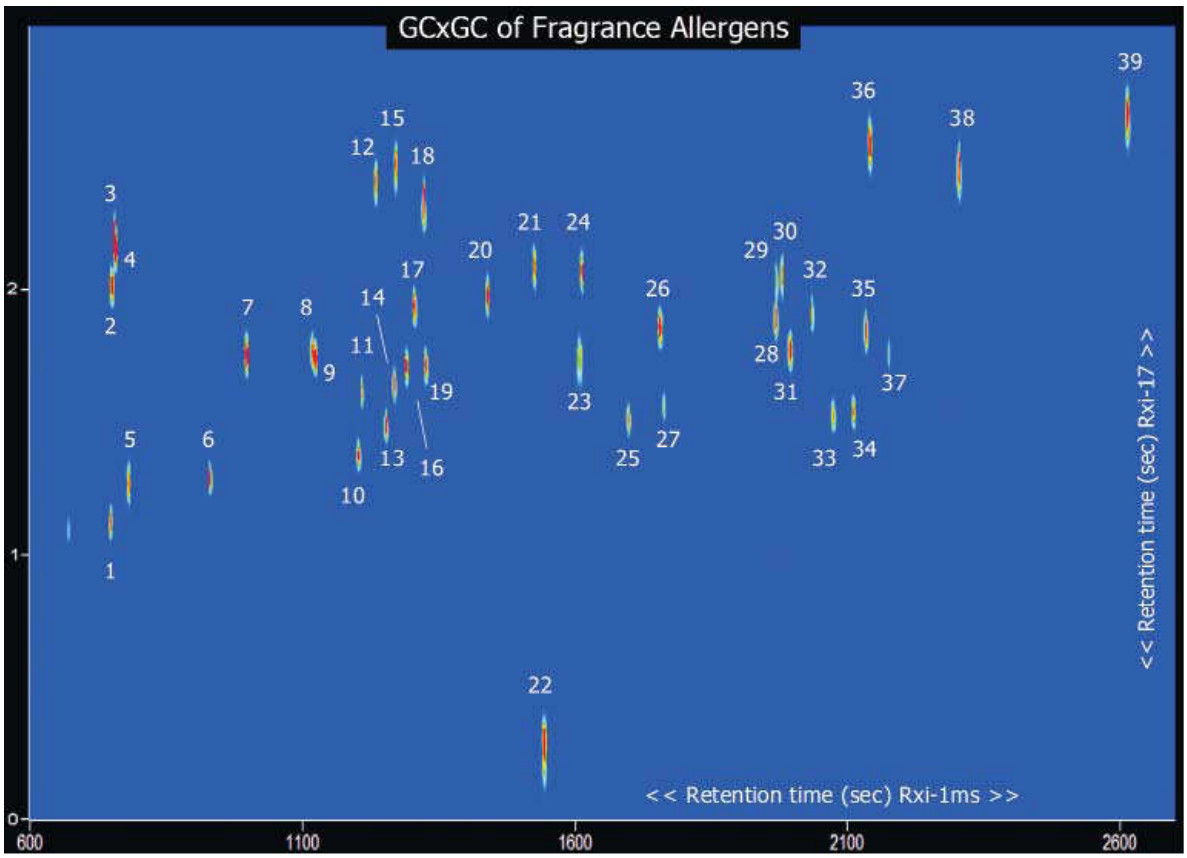
Column	Rtx®-1701, 60 m, 0.25 mm ID, 0.25 µm (cat.# 12026)
Sample	Fragrance materials test mix (cat.# 31807)
Conc.:	5% FMA mix in acetone
Injection	
Inj. Vol.:	1 µL split (split ratio 40:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	285 °C
Oven	
Oven Temp:	50 °C to 270 °C at 3 °C/min
Carrier Gas	He, constant flow
Flow Rate:	0.6 mL/min
Detector	FID @ 300 °C

Peaks	Conc. (wt.%)
1. Ethyl butyrate	35.7
2. Limonene	20.0
3. Eucalyptol	0.5
4. Geraniol	0.6
5. Benzoic acid	1.0
6. Cinnamic aldehyde	0.5
7. Hydroxycitronellal	5.0
8. Thymol	0.3
9. Cinnamyl alcohol	0.3
10. Cinnamyl acetate	0.3
11. Vanillin	0.1
12. Benzyl salicylate	35.7



GC_FF00658

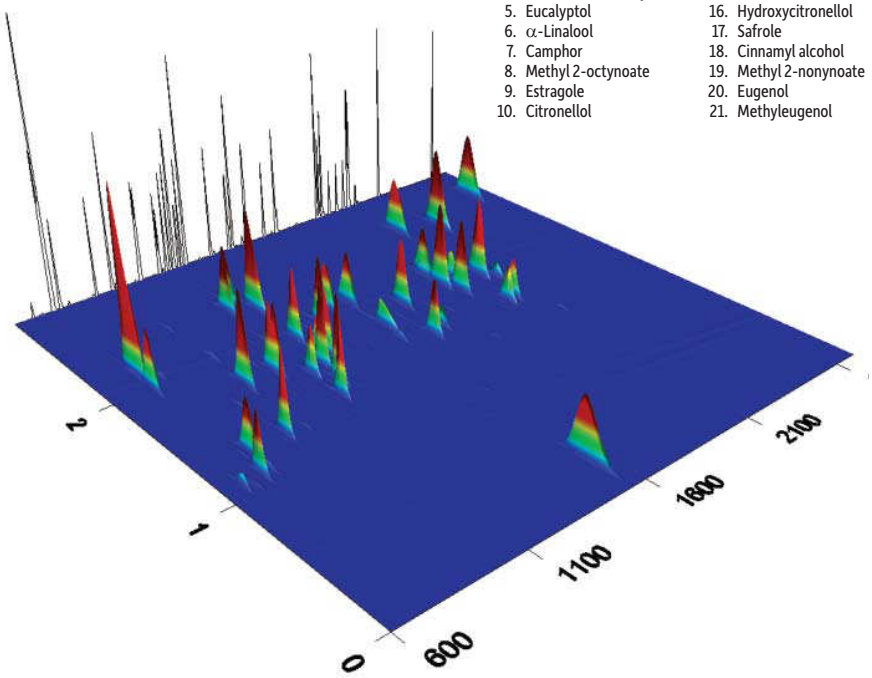
Fragrance Allergens on Rxi®-1ms & Rxi®-17 (GC x GC)



GC_FF01010

Peaks

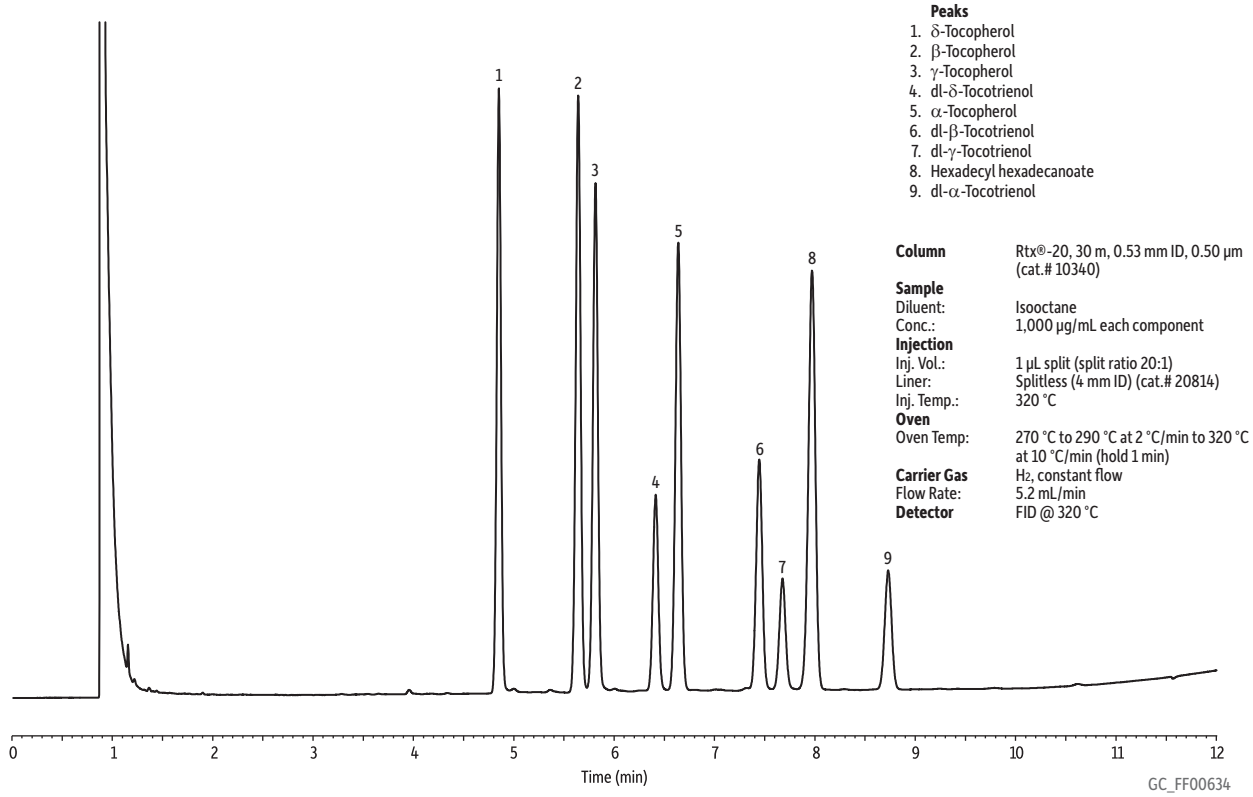
1. Limonene
2. 1-Fluoronaphthalene
3. Benzyl alcohol
4. Benzeneacetaldehyde
5. Eucalyptol
6. α-Linalool
7. Camphor
8. Methyl 2-octynoate
9. Estragole
10. Citronellol
11. Citral 1
12. *trans*-Cinnamaldehyde
13. Geraniol
14. Citral 2
15. Anise alcohol
16. Hydroxycitronellol
17. Safrole
18. Cinnamyl alcohol
19. Methyl 2-nonynoate
20. Eugenol
21. Methyleugenol
22. Coumarin
23. Hydroxycitronellol contaminant
24. Iso-eugenol
25. α-Isomethyl ionone 1
26. Lilial
27. α-Isomethyl ionone 2
28. Amyl cinnamal
29. Lyral 1
30. Lyral 2
31. Amylcinnamyl alcohol 1
32. Amylcinnamyl alcohol 2
33. Farnesol 1
34. Farnesol 2
35. Hexyl cinnamal 1
36. Benzyl benzoate
37. Hexyl cinnamal 2
38. Benzyl salicylate
39. Benzyl cinnamate



GC_FF01011

Column	Rxi®-1ms 30 m, 0.25 mm ID, 0.25 µL (cat.# 13323) Rxi®-17 1 m, 0.10 mm ID, 0.10 µm (cat.# 13501)
Sample	Fragrance allergens
Diluent:	MTBE
Injection	
Inj. Vol.:	0.2 µL split (split ratio 200:1)
Liner:	4 mm laminar cup splitter (cat.# 20801)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	Rxi®-1ms: 40 °C (hold 1 min) to 240 °C at 4 °C/min Rxi®-17: 45 °C (hold 1 min) to 245 °C at 4 °C/min
Carrier Gas	He, corrected constant flow (2 mL/min)
Modulation	
Modulator Temp. Offset:	20 °C
Second Dimension Separation Time:	3 sec
Hot Pulse Time:	0.8 sec
Cool Time between Stages:	0.7 sec
Detector	FID @ 300 °C
Constant Column + Constant Make-up:	50 mL/min
Data Rate:	200 Hz
Notes	Additional Detector Conditions: Hydrogen: 40 mL/min Air: 450 mL/min

Tocopherols and Tocotrienols on Rtx®-20

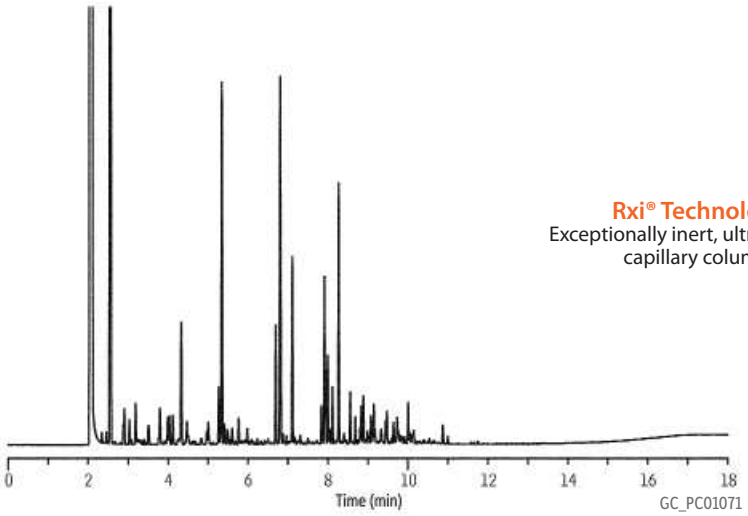


Peaks
1. δ-Tocopherol
2. β-Tocopherol
3. γ-Tocopherol
4. dl-δ-Tocotrienol
5. α-Tocopherol
6. dl-β-Tocotrienol
7. dl-γ-Tocotrienol
8. Hexadecyl hexadecanoate
9. dl-α-Tocotrienol

Column	Rtx®-20, 30 m, 0.53 mm ID, 0.50 µm (cat.# 10340)
Sample	
Diluent:	Isooctane
Conc.:	1,000 µg/mL each component
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Liner:	Splitless (4 mm ID) (cat.# 20814)
Inj. Temp.:	320 °C
Oven	
Oven Temp:	270 °C to 290 °C at 2 °C/min to 320 °C at 10 °C/min (hold 1 min)
Carrier Gas	H_2, constant flow
Flow Rate:	5.2 mL/min
Detector	FID @ 320 °C

GC_FF00634

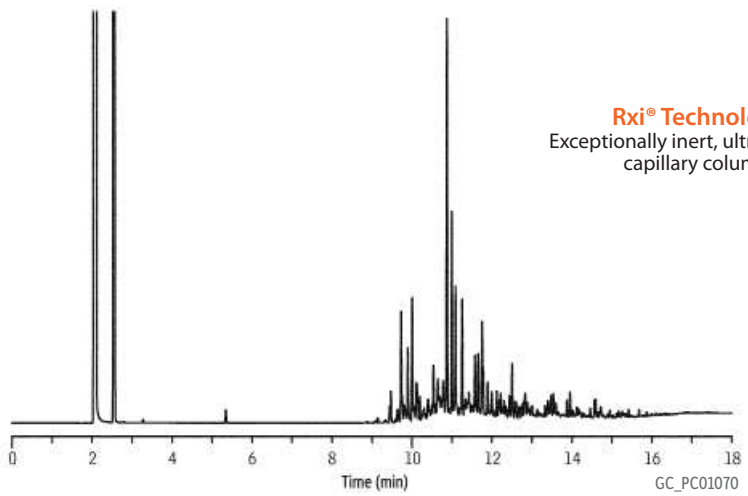
Unleaded Gasoline on Rxi®-1ms



Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

Column	Rxi®-1ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13323)
Sample	Unleaded gasoline: unweathered (cat.# 30096)
Diluent:	Methanol
Conc.:	5,000 µg/mL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Linear Velocity:	28 cm/sec
Detector	FID @ 300 °C

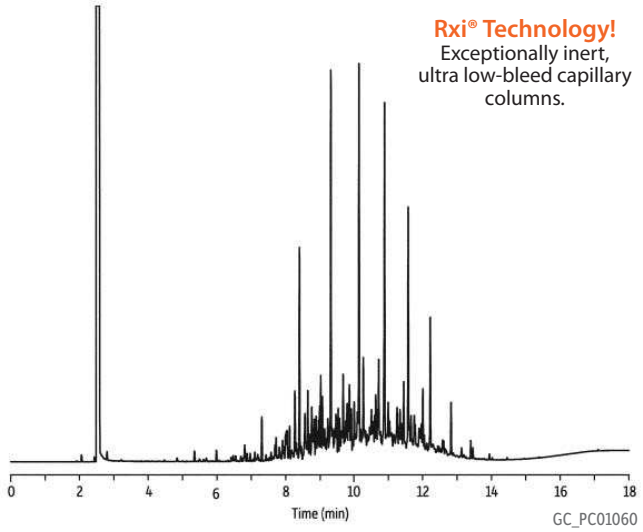
99% Weathered Unleaded Gasoline on Rxi®-1ms



Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

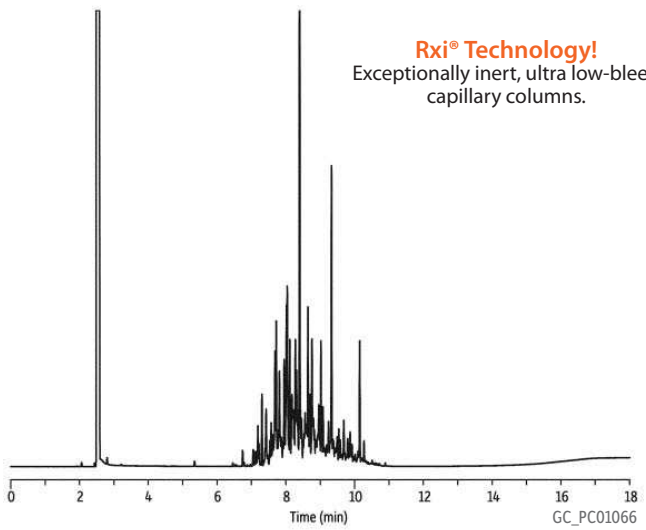
Column	Rxi®-1ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13323)
Sample	Unleaded gasoline: 99% weathered (cat.# 30436)
Diluent:	Methanol
Conc.:	5,000 µg/mL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Linear Velocity:	28 cm/sec
Detector	FID @ 300 °C

Unweathered Kerosene on Rxi®-1ms



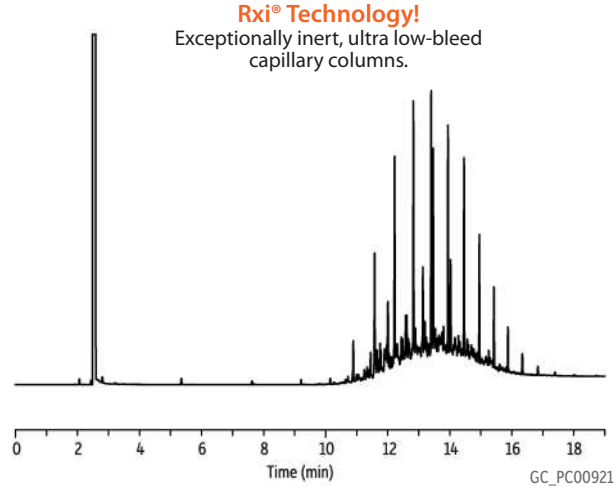
Column	Rxi®-1ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13323)
Sample	Kerosene: unweathered (cat.# 31229)
Diluent:	Methylene chloride
Conc.:	5,000 µg/mL
Injection	
Inj. Vol.:	1 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	28 cm/sec @ 50 °C
Detector	FID @ 300 °C

Mineral Spirits on Rxi®-1ms



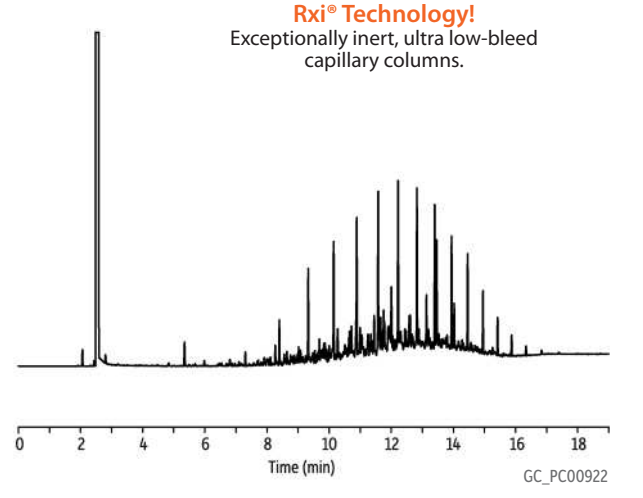
Column	Rxi®-1ms, 30 m, 0.25 mm ID, 0.25 µm (cat.# 13323)
Sample	Mineral spirits: unweathered (cat.# 31225)
Diluent:	Methylene chloride
Conc.:	5,000 µg/mL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Linear Velocity:	28 cm/sec
Detector	FID @ 300 °C

50% Weathered Diesel Fuel #2 on Rxi®-1ms



Column	Rxi®-1ms, 30 m, 0.25 mm ID, 0.50 µm (cat.# 13338)
Sample	Diesel fuel #2: 50% weathered (cat.# 31235)
Diluent:	Methylene chloride
Conc.:	5,000 µg/mL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	28 cm/sec @ 50 °C
Detector	FID @ 300 °C

Unweathered Diesel Fuel #2 on Rxi®-1ms



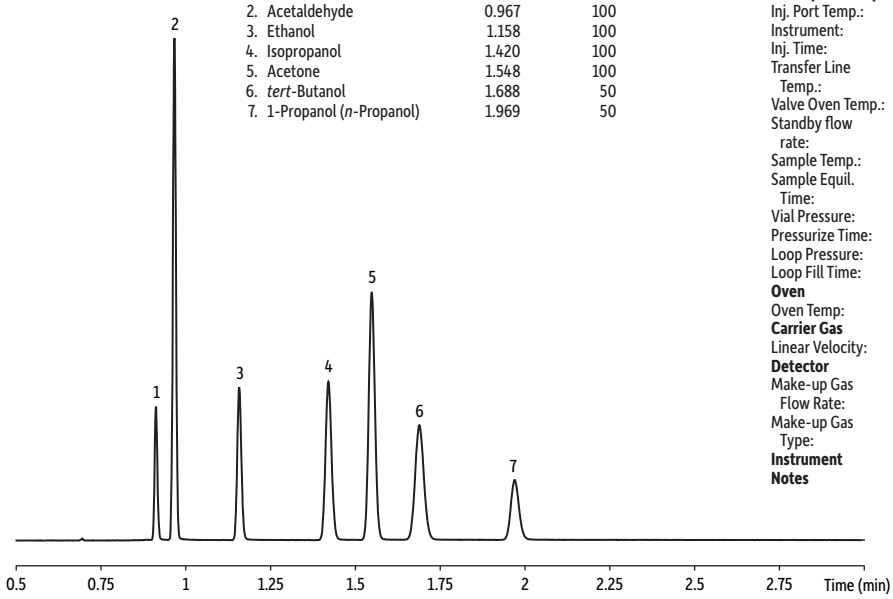
Column	Rxi®-1ms, 30 m, 0.25 mm ID, 0.50 µm (cat.# 13338)
Sample	Diesel fuel #2: unweathered (cat.# 31233)
Diluent:	Methylene chloride
Conc.:	5,000 µg/mL
Injection	
Inj. Vol.:	1.0 µL split (split ratio 20:1)
Liner:	Splitless taper (4 mm) w/wool (cat.# 22405)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 75 °C at 10 °C/min to 300 °C at 20 °C/min (hold 5 min)
Carrier Gas	He, constant linear velocity
Linear Velocity:	28 cm/sec @ 50 °C
Detector	FID @ 300 °C

Blood Alcohol Analysis on Rtx®-BAC Plus 1

NEW!

- Baseline separation of all compounds.
- Symmetrical alcohol peaks.

Peaks	t_R (min)	Conc. (µg/mL)
1. Methanol	0.912	100
2. Acetaldehyde	0.967	100
3. Ethanol	1.158	100
4. Isopropanol	1.420	100
5. Acetone	1.548	100
6. *tert*-Butanol	1.688	50
7. 1-Propanol (*n*-Propanol)	1.969	50



GC_CF1153

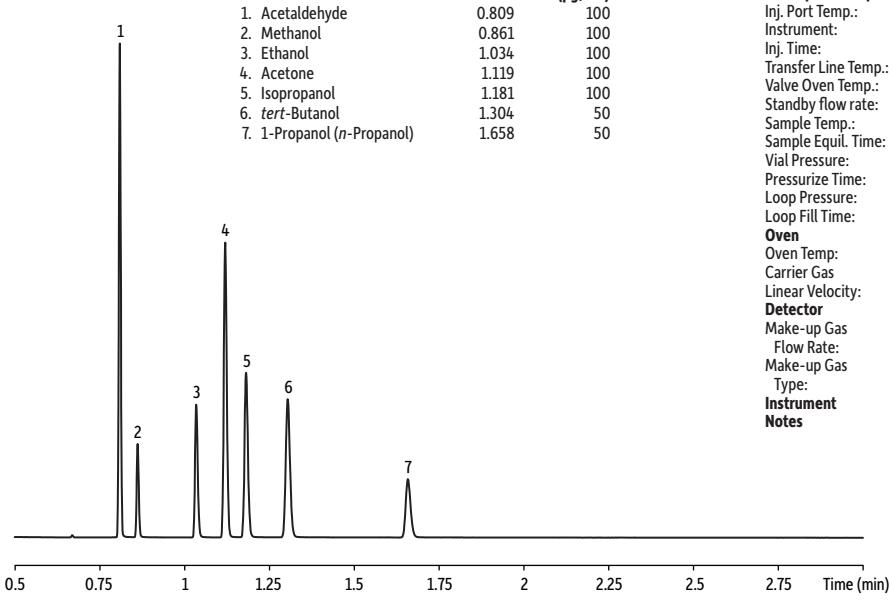
Column	Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004)
Sample	BAC resolution control standard n-P (cat.# 36010) BAC resolution control standard t-B (cat.# 36011)
Diluent:	Water
Conc.:	50 µL of each standard were diluted in 900 µL water in a 20 mL headspace vial.
Injection	Headspace-loop split (split ratio 50:1)
Liner:	1 mm ID straight inlet liner (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	200 °C
Instrument:	Tekmar HT3
Inj. Time:	3 min
Transfer Line Temp.:	125 °C
Valve Oven Temp.:	125 °C
Standby flow rate:	50 mL/min
Sample Temp.:	60 °C
Sample Equil. Time:	5 min
Vial Pressure:	30 psi
Pressurize Time:	1 min
Loop Pressure:	20 psi
Loop Fill Time:	1 min
Oven	
Oven Temp:	40 °C (hold 3 min)
Carrier Gas	He, constant flow
Linear Velocity:	80 cm/sec @ 40 °C
Detector	FID @ 240 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

Blood Alcohol Analysis on Rtx®-BAC Plus 2

NEW!

- Narrow, highly symmetrical peaks.
- All compounds separated in a fast, 2-minute analysis.

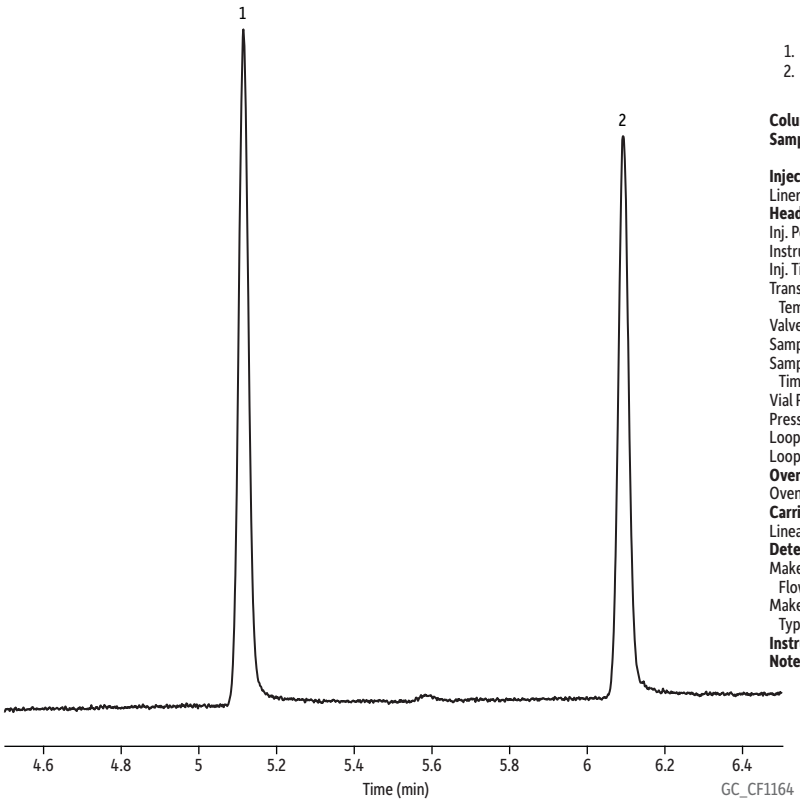
Peaks	t_R (min)	Conc. (µg/mL)
1. Acetaldehyde	0.809	100
2. Methanol	0.861	100
3. Ethanol	1.034	100
4. Acetone	1.119	100
5. Isopropanol	1.181	100
6. *tert*-Butanol	1.304	50
7. 1-Propanol (*n*-Propanol)	1.658	50



GC_CF1154

Column	Rtx®-BAC Plus 2, 30 m, 0.32 mm ID, 0.6 µm (cat.# 18006)
Sample	BAC resolution control standard n-P (cat.# 36010) BAC resolution control standard t-B (cat.# 36011)
Diluent:	Water
Conc.:	50 µL of each standard were diluted in 900 µL water in a 20 mL headspace vial.
Injection	Headspace-loop split (split ratio 50:1)
Liner:	1 mm ID straight inlet liner (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	200 °C
Instrument:	Tekmar HT3
Inj. Time:	3 min
Transfer Line Temp.:	125 °C
Valve Oven Temp.:	125 °C
Standby flow rate:	50 mL/min
Sample Temp.:	60 °C
Sample Equil. Time:	5 min
Vial Pressure:	30 psi
Pressurize Time:	1 min
Loop Pressure:	20 psi
Loop Fill Time:	1 min
Oven	
Oven Temp:	40 °C (hold 3 min)
Carrier Gas	He, constant flow
Linear Velocity:	80 cm/sec @ 40 °C
Detector	FID @ 240 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

GHB Analysis (GBL and AMGBL) on Rtx®-BAC Plus 1

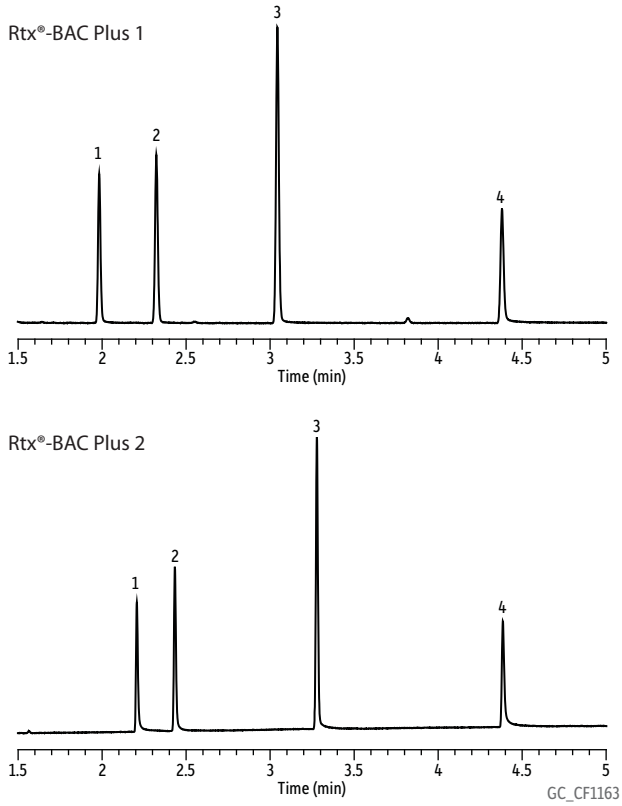


Peaks
1. GBL
2. AMGBL

NEW!

Column	Rtx®-BAC Plus 1, 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004)
Sample	Gamma-butyrolactone (GBL) (cat.# 34077) Alpha-methylene-gamma-butyrolactone (AMGBL) (cat.# 34079)
Injection	Headspace-loop split (split ratio 10:1)
Liner:	1 mm straight inlet liner (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	200 °C
Instrument:	Tekmar HT3
Inj. Time:	1 min
Transfer Line Temp.:	125 °C
Valve Oven Temp.:	125 °C
Sample Temp.:	100 °C
Sample Equil. Time:	10 min
Vial Pressure:	30 psi
Pressurize Time:	2 min
Loop Pressure:	20 psi
Loop Fill Time:	1 min
Oven	
Oven Temp:	80 °C (hold 0 min) to 180 °C at 10 °C/min (hold 0 min)
Carrier Gas	He, constant flow
Linear Velocity:	48 cm/sec
Detector	FID @ 240 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	Sample was prepared by injecting 1 µL of each standard into a capped headspace vial. The mass of each compound inside the headspace vial was 1 µg. Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

Glycols on Rtx®-BAC Plus 1 and 2 Column Set



GC_CF1163

NEW!

Peaks	BAC Plus 1 t_R (min)	BAC Plus 2 t_R (min)
1. Ethylene glycol	1.983	2.207
2. Propylene glycol	2.323	2.433
3. 1,3-Propanediol	3.043	3.278
4. Diethylene glycol	4.380	4.385

Columns Rtx®-BAC Plus 1 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004) and Rtx®-BAC Plus 2 30 m, 0.32 mm ID, 0.6 µm (cat.# 18006) using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039) with Universal "Y" Press-Tight® connector (cat.# 20405-261)

Sample
Diluent: Methanol:water (40:60)
Conc.: 200 µg/mL each glycol

Injection
Inj. Vol.: 1 µL split (split ratio 20:1)
Liner: Sky® 4 mm straight inlet liner w/wool (cat.# 23300.1)
Inj. Temp.: 260 °C

Oven
Oven Temp: 60 °C (hold 0 min) to 240 °C at 20 °C/min (hold 5 min)

Carrier Gas He, constant flow
Linear Velocity: 70 cm/sec

Detector FID @ 240 °C
Make-up Gas Flow Rate: 30 mL/min
Make-up Gas Type: N_2

Instrument Agilent/HP6890 GC

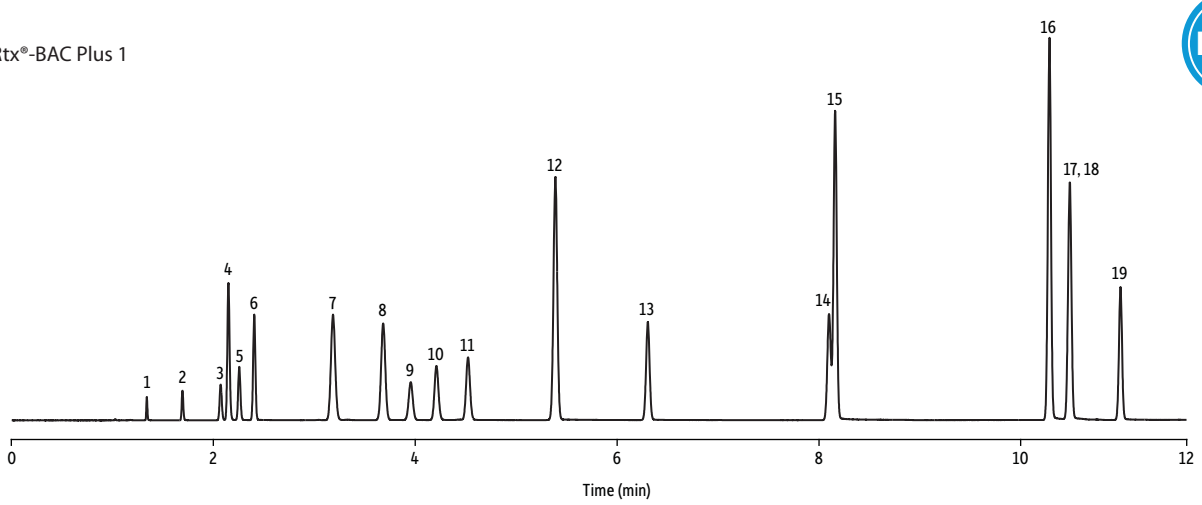
Notes The Rtx®-BAC Plus 1 and Plus 2 columns were connected to the injection port using a ~12 inch section of guard column between the injection port and the universal "Y" Press-Tight® connector.

Injections were performed manually with a Merlin Microshot injector (cat.# 22229).

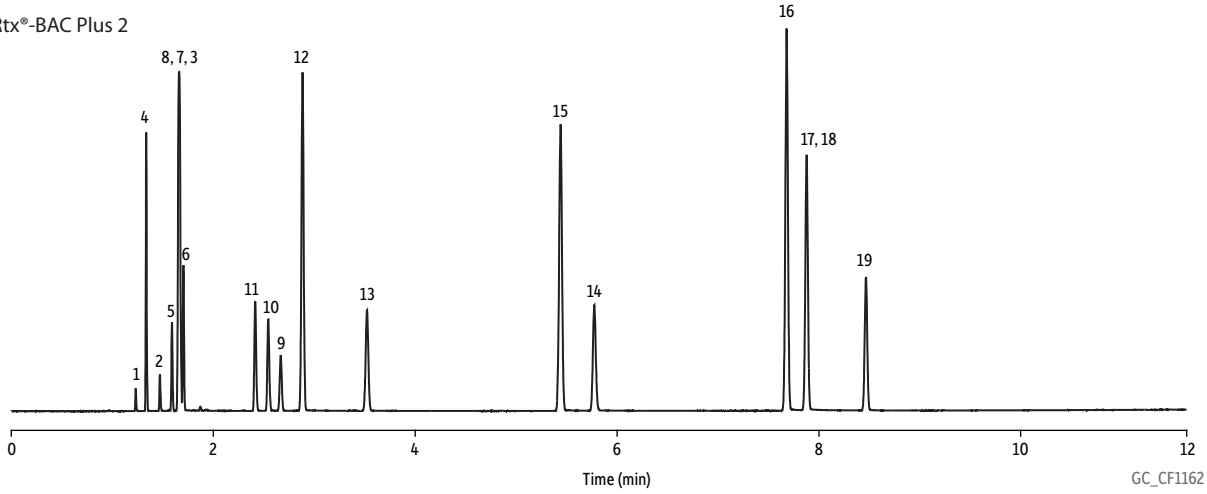
Inhalants on Rtx®-BAC Plus 1 and Plus 2 Column Set

NEW!

Rtx®-BAC Plus 1



Rtx®-BAC Plus 2

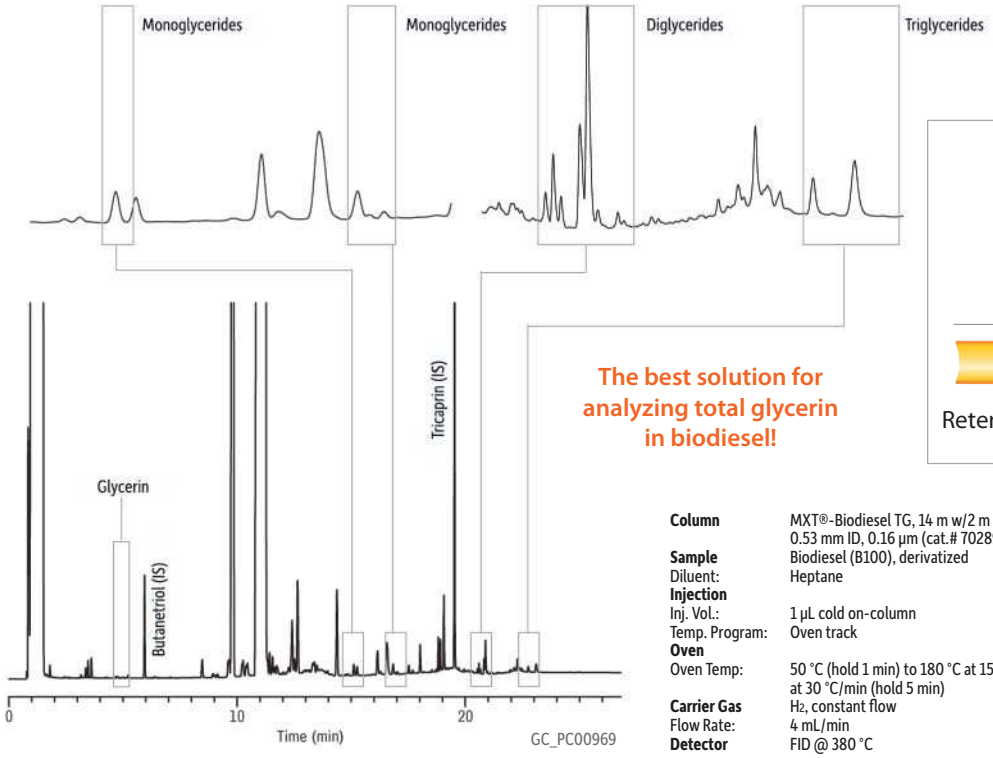


GC_CF1162

Columns	Rtx®-BAC Plus 1 30 m, 0.32 mm ID, 1.8 µm (cat.# 18004) and Rtx®-BAC Plus 2 30 m, 0.32 mm ID, 0.6 µm (cat.# 18006) using Rxi® guard column 5 m, 0.32 mm ID (cat.# 10039) with universal "Y" Press-Tight® connector (cat.# 20405-261)
Sample	
Diluent:	Water
Conc.:	50 µg/mL each inhalant
Injection	Headspace-loop split (split ratio 50:1)
Liner:	1 mm straight inlet liner (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	220 °C
Instrument:	Tekmar HT3
Inj. Time:	3 min
Transfer Line Temp.:	125 °C
Valve Oven Temp.:	125 °C
Sample Temp.:	70 °C
Sample Equil. Time:	5 min
Vial Pressure:	30 psi
Pressurize Time:	2 min
Loop Pressure:	20 psi
Loop Fill Time:	1 min
Oven	
Oven Temp:	40 °C (hold 4 min) to 120 °C at 10 °C/min (hold 0 min)
Carrier Gas	He, constant flow
Linear Velocity:	50 cm/sec
Detector	FID @ 240 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	The Rtx®-BAC Plus 1 and Plus 2 columns were connected to the injection port using a ~12 inch section of guard column between the injection port and the universal Y Press-Tight® connector.
	Headspace concentrator courtesy of Teledyne Tekmar, Mason, OH.

Peaks	BAC Plus 1 t_R (min)	BAC Plus 2 t_R (min)
1. Methanol	1.340	1.230
2. Ethanol	1.694	1.470
3. Isopropanol	2.072	1.660
4. Diethyl ether	2.149	1.334
5. Acetone	2.256	1.589
6. Methylene chloride	2.405	1.703
7. MTBE	3.185	1.660
8. Hexane	3.683	1.660
9. Chloroform	3.956	2.667
10. MEK	4.210	2.543
11. Ethyl acetate	4.524	2.414
12. Benzene	5.390	2.883
13. Trichloroethylene	6.306	3.522
14. MIBK	8.101	5.775
15. Toluene	8.162	5.440
16. Ethylbenzene	10.286	7.681
17. *m*-Xylene	10.487	7.879
18. *p*-Xylene	10.487	7.879
19. *o*-Xylene	10.990	8.467

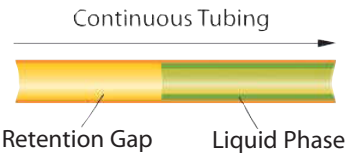
Total Glycerin in Biodiesel on MXT®-Biodiesel TG



The best solution for analyzing total glycerin in biodiesel!

Integra-Gap® Technology

- Built-in retention gap
- Eliminates connector

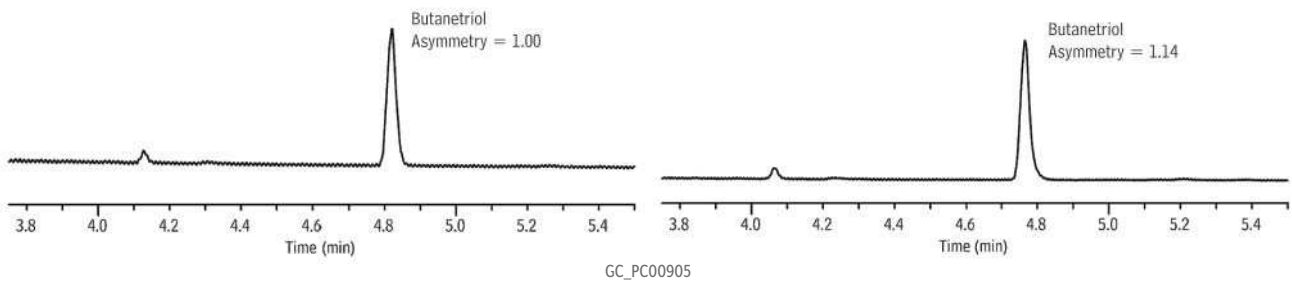


Column	MXT®-Biodiesel TG, 14 m w/2 m Integra-Gap® (16 m total length), 0.53 mm ID, 0.16 µm (cat.# 70289)
Sample	Biodiesel (B100), derivatized
Diluent:	Heptane
Injection	
Inj. Vol.:	1 µL cold on-column
Temp. Program:	Oven track
Oven	
Oven Temp:	50 °C (hold 1 min) to 180 °C at 15 °C/min to 230 °C at 7 °C/min to 380 °C at 30 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	4 mL/min
Detector	FID @ 380 °C

Biodiesel Oil (B100) on Rtx®-Biodiesel TG

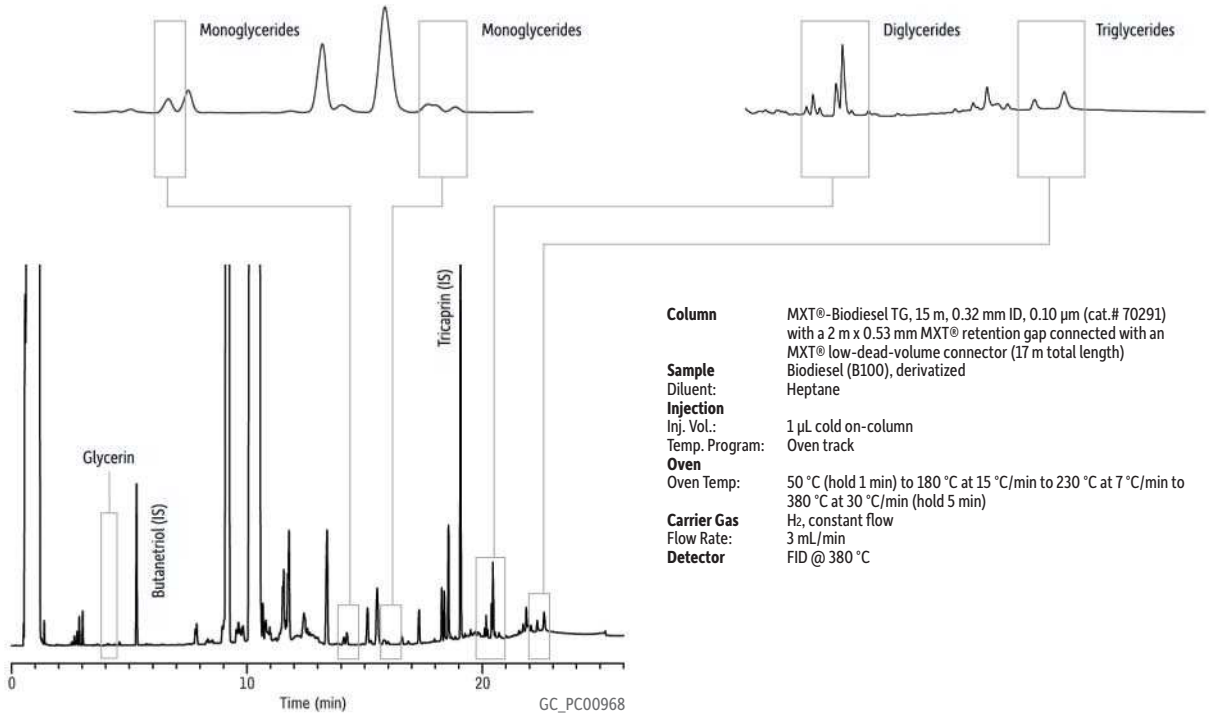
A. Rtx®-Biodiesel TG
with Alumaseal® connector and
2 meters of 0.53 mm ID Hydroguard® tubing

B. Rtx®-Biodiesel TG
with universal Press-Tight® connector and
2 meters of 0.53 mm ID Hydroguard® tubing



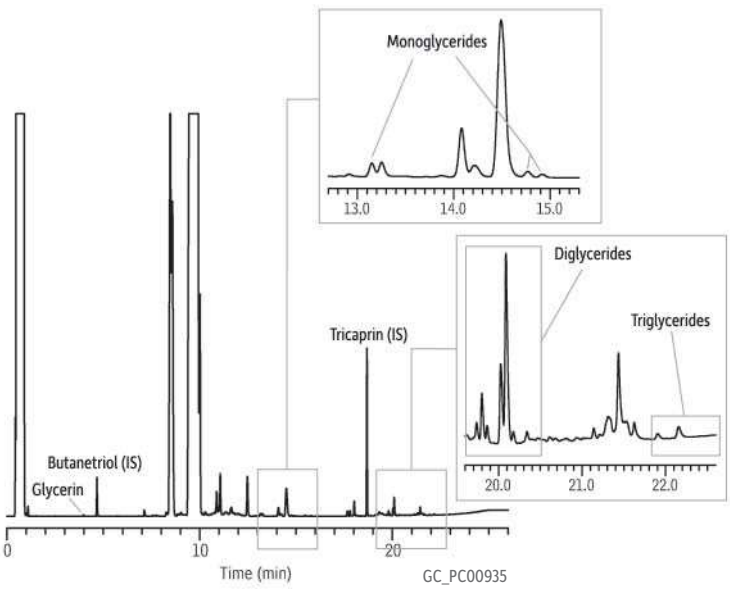
Column	Rtx®-Biodiesel TG, 10 m, 0.32 mm ID, 0.10 µm (cat.# 10291) using Hydroguard® retention gap 2 m, 0.53 mm ID
Sample	Biodiesel (B100) with butanetriol
Conc.:	12.5 ppm (12.5 ng on-column)
Injection	
Inj. Vol.:	1.0 µL cold on-column
Temp. Program:	Oven track mode
Oven	
Oven Temp:	50 °C (hold 1 min) to 180 °C at 15 °C/min to 230 °C at 7 °C/min to 380 °C at 30 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	4 mL/min
Linear Velocity:	79 cm/sec
Detector	FID @ 380 °C

B100 on MXT®-Biodiesel TG



Column	MXT®-Biodiesel TG, 15 m, 0.32 mm ID, 0.10 µm (cat.# 70291) with a 2 m x 0.53 mm MXT® retention gap connected with an MXT® low-dead-volume connector (17 m total length)
Sample	Biodiesel (B100), derivatized
Diluent:	Heptane
Injection	
Inj. Vol.:	1 µL cold on-column
Temp. Program:	Oven track
Oven	
Oven Temp:	50 °C (hold 1 min) to 180 °C at 15 °C/min to 230 °C at 7 °C/min to 380 °C at 30 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Detector	FID @ 380 °C

ASTM D6584 Derivatized B100 and Internal Standards on MXT®-Biodiesel TG

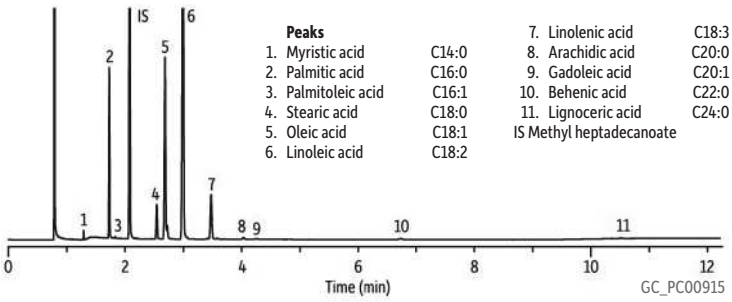


Note perfect solvent peak shape!

Column	MXT®-Biodiesel TG w/2 m x 0.53 mm retention gap, 10 m, 0.32 mm ID, 0.10 µm (cat.# 70290)
Sample	B100 + IS butanetriol & tricaprin derivatized with MSTFA as per ASTM D6584
Injection	
Inj. Vol.:	1.0 µL cold on-column
Temp. Program:	Oven track
Oven	
Oven Temp:	50 °C (hold 1 min) to 180 °C at 15 °C/min to 230 °C at 7 °C/min to 430 °C at 30 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	4 mL/min
Detector	FID @ 430 °C

FAMEs in Biodiesel Oils on Stabilwax®

Soy FAMEs in Biodiesel Oils on Stabilwax®

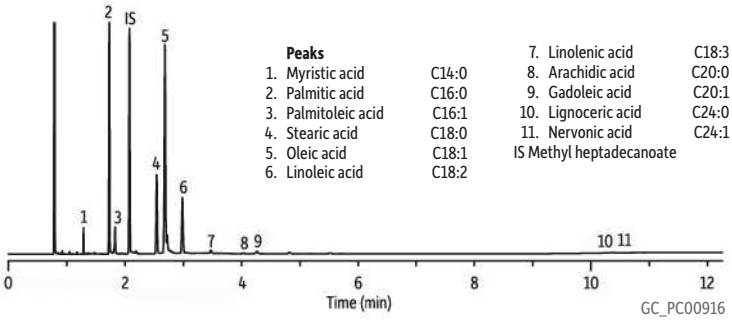


GC_PC00915

Peaks			
1.	Myristic acid	C14:0	
2.	Palmitic acid	C16:0	
3.	Palmitoleic acid	C16:1	
4.	Stearic acid	C18:0	
5.	Oleic acid	C18:1	
6.	Linoleic acid	C18:2	
7.	Linolenic acid	C18:3	
8.	Arachidic acid	C20:0	
9.	Gadoleic acid	C20:1	
10.	Behenic acid	C22:0	
11.	Lignoceric acid	C24:0	
	IS Methyl heptadecanoate		

Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Soy source of biodiesel (B100), prepared according to European Method EN 14103
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Cyclosplitter® (cat.# 20706)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Linear Velocity:	60 cm/sec
Detector	FID @ 250 °C

Tallow FAMEs in Biodiesel Oils on Stabilwax®

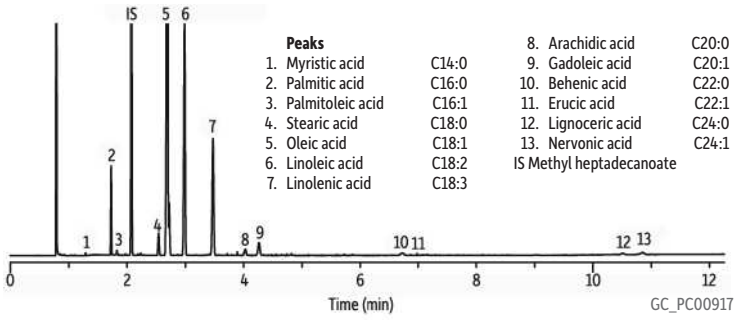


GC_PC00916

Peaks			
1.	Myristic acid	C14:0	
2.	Palmitic acid	C16:0	
3.	Palmitoleic acid	C16:1	
4.	Stearic acid	C18:0	
5.	Oleic acid	C18:1	
6.	Linoleic acid	C18:2	
7.	Linolenic acid	C18:3	
8.	Arachidic acid	C20:0	
9.	Gadoleic acid	C20:1	
10.	Lignoceric acid	C24:0	
11.	Nervonic acid	C24:1	
	IS Methyl heptadecanoate		

Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Tallow source of biodiesel (B100), prepared according to European Method EN 14103
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Cyclosplitter® (cat.# 20706)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Linear Velocity:	60 cm/sec
Detector	FID @ 250 °C

Rapeseed FAMEs in Biodiesel Oils on Stabilwax®

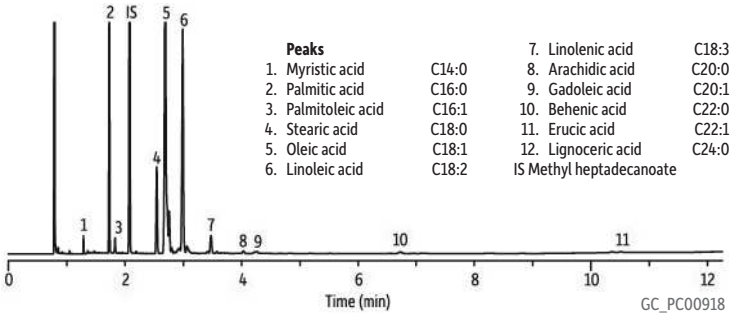


GC_PC00917

Peaks			
1.	Myristic acid	C14:0	
2.	Palmitic acid	C16:0	
3.	Palmitoleic acid	C16:1	
4.	Stearic acid	C18:0	
5.	Oleic acid	C18:1	
6.	Linoleic acid	C18:2	
7.	Linolenic acid	C18:3	
8.	Arachidic acid	C20:0	
9.	Gadoleic acid	C20:1	
10.	Behenic acid	C22:0	
11.	Erucic acid	C22:1	
12.	Lignoceric acid	C24:0	
13.	Nervonic acid	C24:1	
	IS Methyl heptadecanoate		

Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Rapeseed source of biodiesel (B100), prepared according to European Method EN 14103
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Cyclosplitter® (cat.# 20706)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Linear Velocity:	60 cm/sec
Detector	FID @ 250 °C

Yellow Grease FAMEs in Biodiesel Oils on Stabilwax®



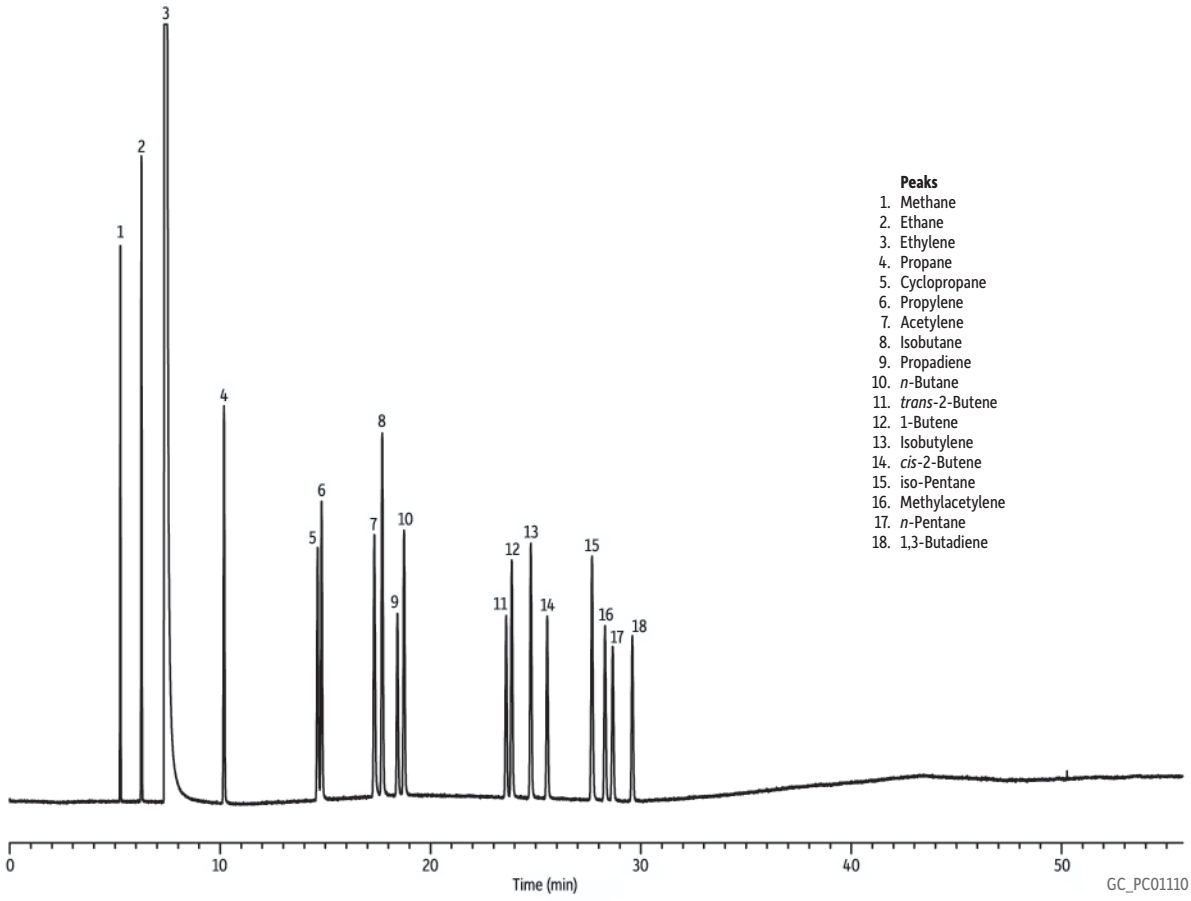
GC_PC00918

Peaks			
1.	Myristic acid	C14:0	
2.	Palmitic acid	C16:0	
3.	Palmitoleic acid	C16:1	
4.	Stearic acid	C18:0	
5.	Oleic acid	C18:1	
6.	Linoleic acid	C18:2	
7.	Linolenic acid	C18:3	
8.	Arachidic acid	C20:0	
9.	Gadoleic acid	C20:1	
10.	Behenic acid	C22:0	
11.	Erucic acid	C22:1	
12.	Lignoceric acid	C24:0	
	IS Methyl heptadecanoate		

Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Yellow grease source of biodiesel (B100), prepared according to European Method EN 14103
Injection	
Inj. Vol.:	1.0 µL split (split ratio 100:1)
Liner:	Cyclosplitter® (cat.# 20706)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)
Carrier Gas	H_2, constant flow
Flow Rate:	3 mL/min
Linear Velocity:	60 cm/sec
Detector	FID @ 250 °C

Ethylene and C1-C5 Hydrocarbons by ASTM D6159-97 on Rt®-Alumina BOND/KCl, Rtx®-1

(PLOT)



Peaks

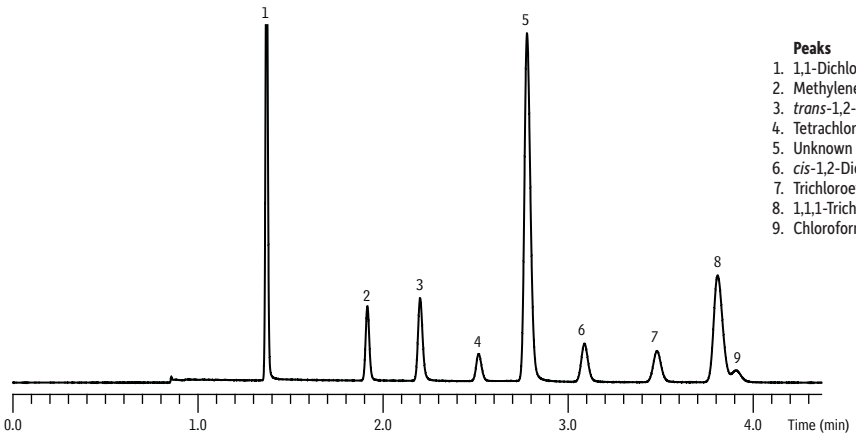
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Acetylene
8. Isobutane
9. Propadiene
10. *n*-Butane
11. *trans*-2-Butene
12. 1-Butene
13. Isobutylene
14. *cis*-2-Butene
15. iso-Pentane
16. Methylacetylene
17. *n*-Pentane
18. 1,3-Butadiene

Column	Rt®-Alumina BOND/KCl *, 50 m, 0.53 mm ID, 10 µm (cat.# 19760)
Sample	Ethylene gas plus C1 through C5 hydrocarbons
Injection	
Inj. Vol.:	1 µL split
Liner:	2 mm splitless (cat.# 20712)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	60 mL/min
Oven	
Oven Temp:	35 °C (hold 2 min) to 190 °C at 4 °C/min (hold 15 min)
Carrier Gas	He, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	25.4 cm/sec @ 35 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC
Notes	* Rt®-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10.0 µm (cat.# 19760) in series with an Rtx®-1, 30 m, 0.53 mm ID, 5.0 µm (cat.# 10179) connected using a universal Press-Tight® connector (cat.# 20401)
	(conditions as per ASTM D6159-97)

Halogenated Hydrocarbons on Rt®-Alumina BOND/CFC

(PLOT)

NEW!



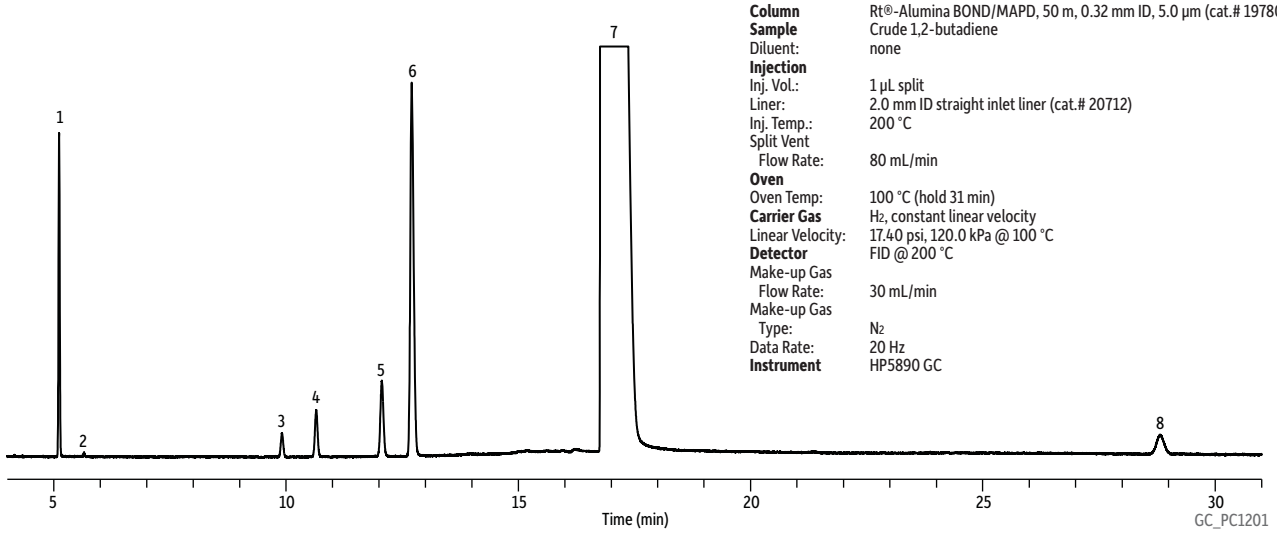
Peaks
1. 1,1-Dichloroethylene
2. Methylene chloride
3. *trans*-1,2-Dichloroethylene
4. Tetrachloromethane
5. Unknown
6. *cis*-1,2-Dichloroethylene
7. Trichloroethylene
8. 1,1,1-Trichloroethane
9. Chloroform

Column	Rt®-Alumina BOND/CFC, 30 m, 0.53 mm ID, 10 µm (cat.# 19763)
Injection	Split (split ratio 20:1)
Split Vent Flow Rate:	170 mL/min
Oven	
Oven Temp:	135 °C
Carrier Gas	H_2, constant flow
Flow Rate:	8 mL/min @ 135 °C
Detector	FID @ 220 °C

Light Hydrocarbons on Rt®-Alumina BOND/MAPD

NEW!

Peaks
1. Isobutane
2. *n*-Butane
3. *trans*-2-Butene
4. 1-Butene
5. Isobutylene
6. *cis*-2-Butene
7. 1,2-Butadiene
8. *n*-Hexane



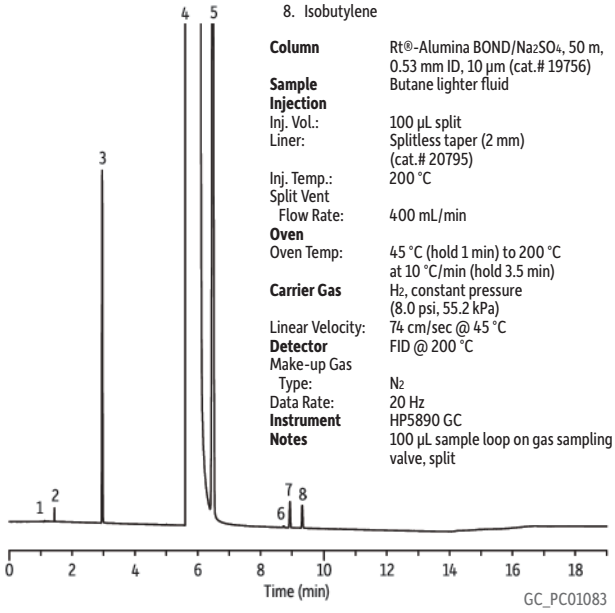
Column	Rt®-Alumina BOND/MAPD, 50 m, 0.32 mm ID, 5.0 µm (cat.# 19780)
Sample	Crude 1,2-butadiene
Diluent:	none
Injection	
Inj. Vol.:	1 µL split
Liner:	2.0 mm ID straight inlet liner (cat.# 20712)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	80 mL/min
Oven	
Oven Temp:	100 °C (hold 31 min)
Carrier Gas	H_2, constant linear velocity
Linear Velocity:	17.40 psi, 120.0 kPa @ 100 °C
Detector	FID @ 200 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

Butane Lighter Fluid on Rt®-Alumina BOND/Na_2SO_4

(PLOT)

Peaks
1. Methane
2. Ethane
3. Propane
4. Isobutane
5. *n*-Butane
6. *trans*-2-Butene
7. 1-Butene
8. Isobutylene

Column	Rt®-Alumina BOND/Na_2SO_4, 50 m, 0.53 mm ID, 10 µm (cat.# 19756)
Sample	Butane lighter fluid
Injection	
Inj. Vol.:	100 µL split
Liner:	Splitless taper (2 mm) (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	400 mL/min
Oven	
Oven Temp:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	74 cm/sec @ 45 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC
Notes	100 µL sample loop on gas sampling valve, split



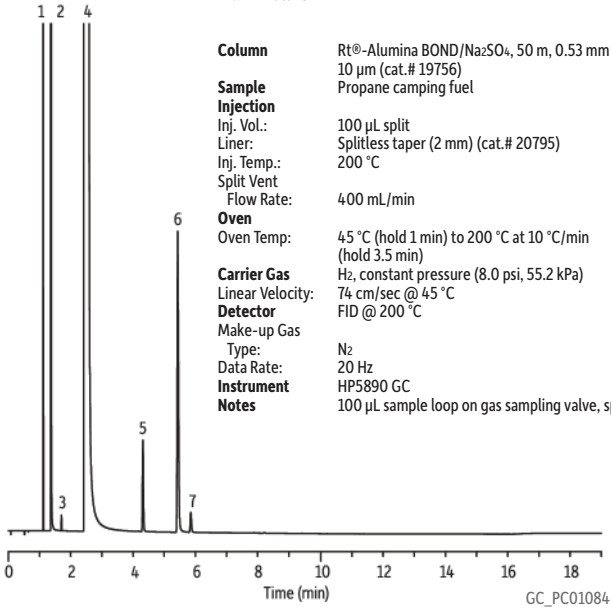
GC_PC01083

Propane Camping Fuel on Rt®-Alumina BOND/Na_2SO_4

(PLOT)

Peaks
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. *n*-Butane

Column	Rt®-Alumina BOND/Na_2SO_4, 50 m, 0.53 mm ID, 10 µm (cat.# 19756)
Sample	Propane camping fuel
Injection	
Inj. Vol.:	100 µL split
Liner:	Splitless taper (2 mm) (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	400 mL/min
Oven	
Oven Temp:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	74 cm/sec @ 45 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC
Notes	100 µL sample loop on gas sampling valve, split



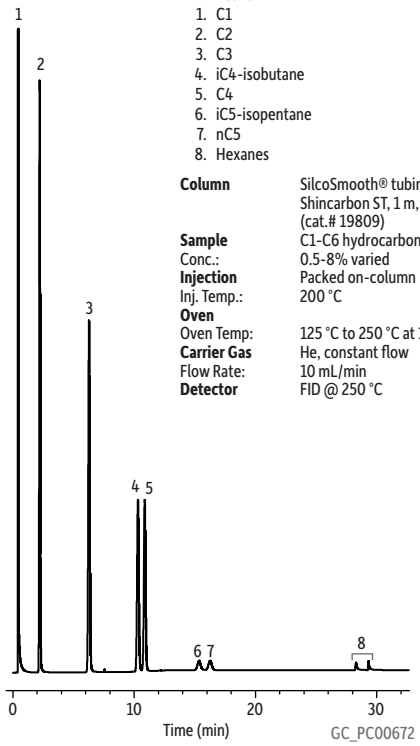
GC_PC01084

Natural Gas on ShinCarbon ST

(micropacked)

Peaks
1. C1
2. C2
3. C3
4. iC4-isobutane
5. C4
6. iC5-isopentane
7. nC5
8. Hexanes

Column	SilcoSmooth® tubing, 100/120 mesh on Shincarbon ST, 1 m, 1/16 OD, 1.0 mm ID (cat.# 19809)
Sample	C1-C6 hydrocarbons
Conc.:	0.5-8% varied
Injection	Packed on-column
Inj. Temp.:	200 °C
Oven	
Oven Temp:	125 °C to 250 °C at 16 °C/min
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	FID @ 250 °C

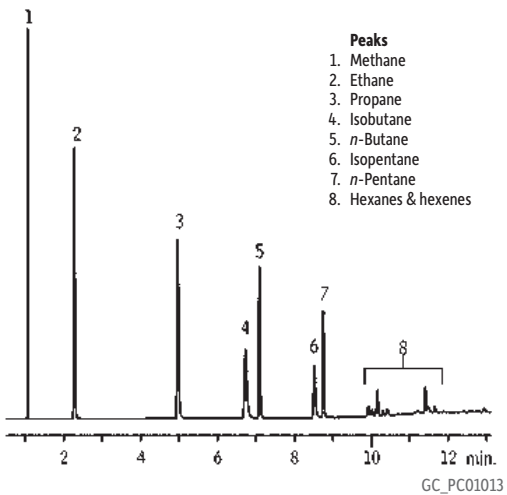


GC_PC00672

Natural Gas #2 on Rt®-QS-BOND

(PLOT)

Peaks
1. Methane
2. Ethane
3. Propane
4. Isobutane
5. *n*-Butane
6. Isopentane
7. *n*-Pentane
8. Hexanes & hexenes

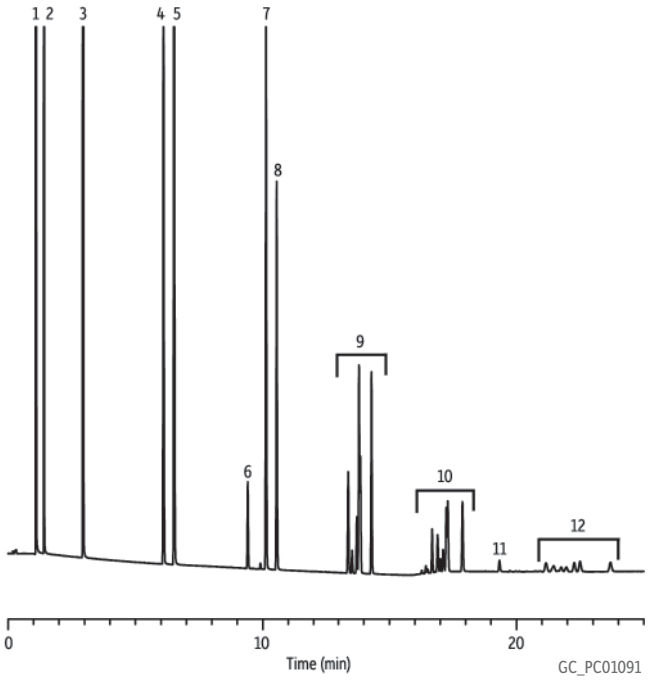


GC_PC01013

Column	Rt®-QS-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19738)
Sample	Natural gas mix (mole%)
Injection	
Inj. Vol.:	20 µL split (split ratio 10:1)
Liner:	Siltek® splitless taper (4 mm) (cat.# 20798-214.1)
Inj. Temp.:	240 °C
Oven	
Oven Temp:	40 °C (hold 2 min) to 225 °C at 20 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	5.7 mL/min
Detector	FID @ 240 °C

Natural Gas on Rt®-Alumina BOND/KCl

(PLOT)

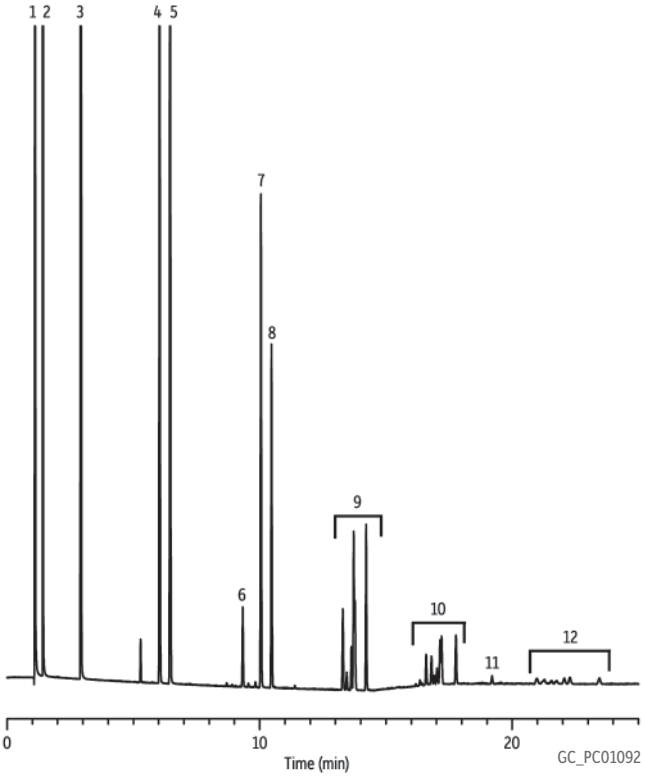


Peaks
1. Methane
2. Ethane
3. Propane
4. Isobutane
5. *n*-Butane
6. neo-Pentane
7. iso-Pentane
8. *n*-Pentane
9. Hexane isomers
10. Heptane isomers
11. Benzene
12. Octane isomers

Column	Rt®-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (cat.# 19760)
Sample	Natural gas
Injection	
Inj. Vol.:	500 µL split
Liner:	2.0 mm ID single taper (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	50 mL/min
Oven	
Oven Temp:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 8.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	45 cm/sec @ 45 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

Natural Gas on Rt®-Alumina BOND/Na_2SO_4

(PLOT)

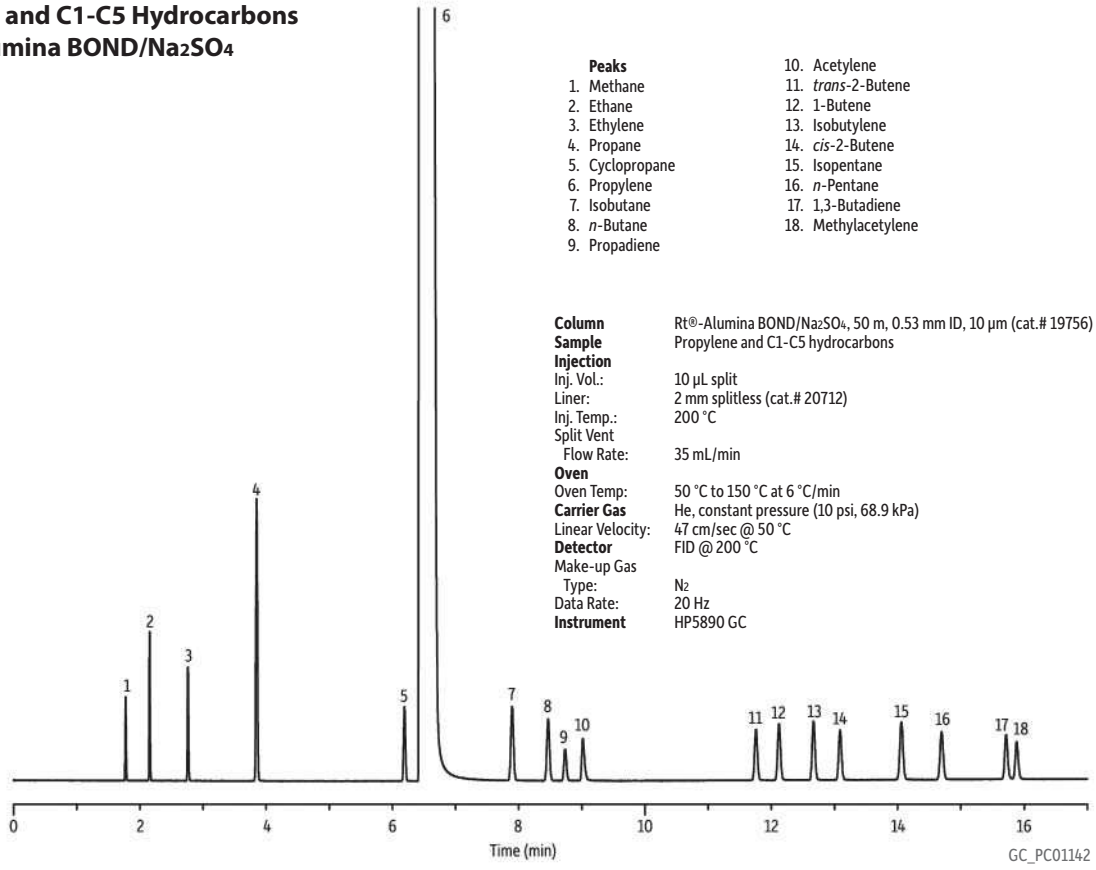


Peaks
1. Methane
2. Ethane
3. Propane
4. Isobutane
5. *n*-Butane
6. neo-Pentane
7. iso-Pentane
8. *n*-Pentane
9. Hexane isomers
10. Heptane isomers
11. Benzene
12. Octane isomers

Column	Rt®-Alumina BOND/Na_2SO_4, 50 m, 0.53 mm ID, 10 µm (cat.# 19756)
Sample	Natural gas
Injection	
Inj. Vol.:	500 µL split
Liner:	2.0 mm ID single taper (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	50 mL/min
Oven	
Oven Temp:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 8.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	45 cm/sec @ 45 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

Propylene and C1-C5 Hydrocarbons on Rt®-Alumina BOND/Na_2SO_4

(PLOT)



GC_PC01142

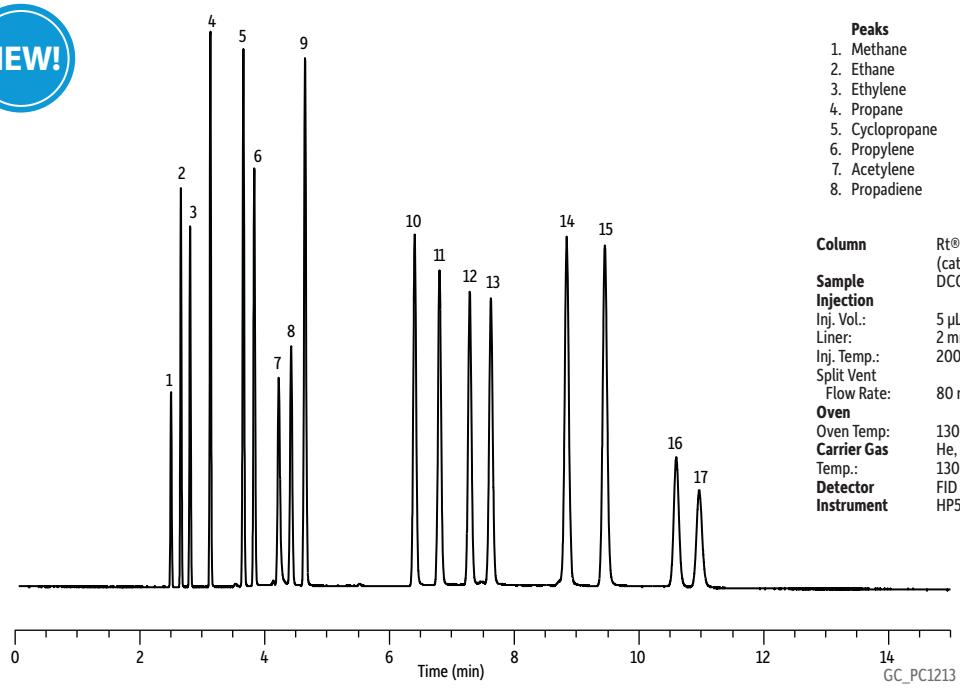
Peaks
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Isobutane
8. *n*-Butane
9. Propadiene
10. Acetylene
11. *trans*-2-Butene
12. 1-Butene
13. Isobutylene
14. *cis*-2-Butene
15. Isopentane
16. *n*-Pentane
17. 1,3-Butadiene
18. Methylacetylene

Column	Rt®-Alumina BOND/Na_2SO_4, 50 m, 0.53 mm ID, 10 µm (cat.# 19756)
Sample	Propylene and C1-C5 hydrocarbons
Injection	
Inj. Vol.:	10 µL split
Liner:	2 mm splitless (cat.# 20712)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	35 mL/min
Oven	
Oven Temp:	50 °C to 150 °C at 6 °C/min
Carrier Gas	He, constant pressure (10 psi, 68.9 kPa)
Linear Velocity:	47 cm/sec @ 50 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

C1-C5 Hydrocarbons on Rt®-Alumina BOND/MAPD

(PLOT)

NEW!



GC_PC1213

Peaks
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Cyclopropane
6. Propylene
7. Acetylene
8. Propadiene
9. *n*-Butane
10. *trans*-2-Butene
11. 1-Butene
12. Isobutene
13. *cis*-2-Butene
14. Isopentane
15. *n*-Pentane
16. 1,3-Butadiene
17. Methyl acetylene

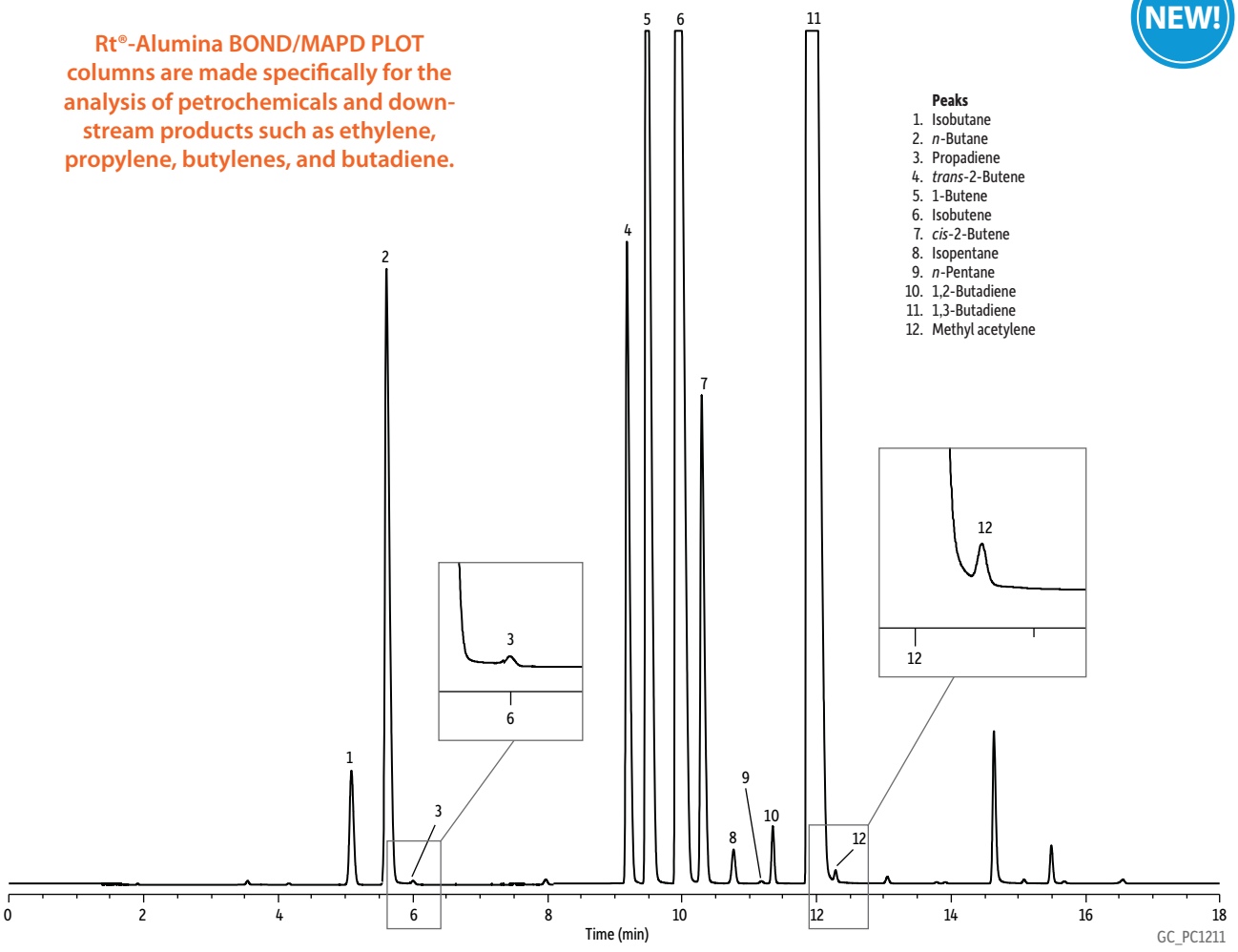
Column	Rt®-Alumina BOND/MAPD, 50 m, 0.53 mm ID, 10 µm (cat.# 19778)
Sample	DCG custom standard (cat.# 547267)
Injection	
Inj. Vol.:	5 µL split
Liner:	2 mm single taper (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	80 mL/min
Oven	
Oven Temp:	130 °C (hold 8 min)
Carrier Gas	He, constant pressure (4.4 psi, 30.3 kPa)
Temp.:	130 °C
Detector	FID @ 200 °C
Instrument	HP5890 GC

1,3-Butadiene on Rt®-Alumina BOND/MAPD (Purity Analysis)

(PLOT)

NEW!

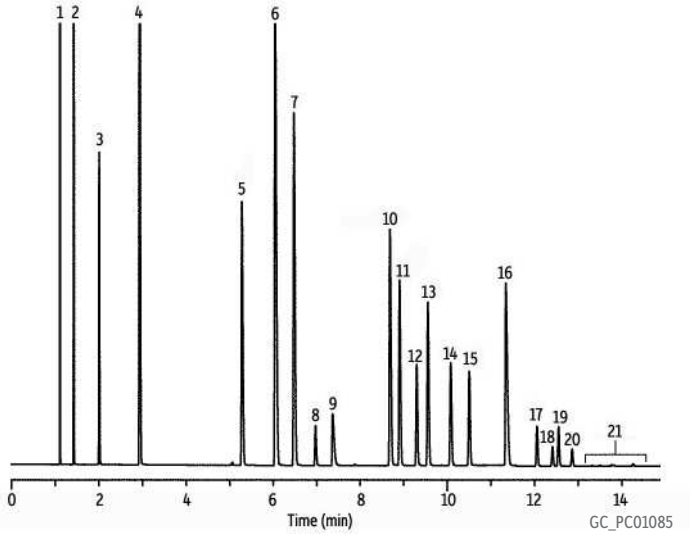
Rt®-Alumina BOND/MAPD PLOT columns are made specifically for the analysis of petrochemicals and downstream products such as ethylene, propylene, butylenes, and butadiene.



Column	Rt®-Alumina BOND/MAPD, 50 m, 0.53 mm ID, 10.0 µm (cat.# 19778)
Sample	Crude 1,3-butadiene
Injection	
Inj. Vol.:	10 µL split
Liner:	2.0 mm ID straight inlet liner (cat.# 20712)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp:	70 °C (hold 5 min) to 200 °C at 10 °C/min (hold 0 min)
Carrier Gas	He, constant pressure (20 psi, 137.9 kPa)
Detector	FID @ 250 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

Refinery Gas on Rt®-Alumina BOND (Na_2SO_4)

(PLOT)



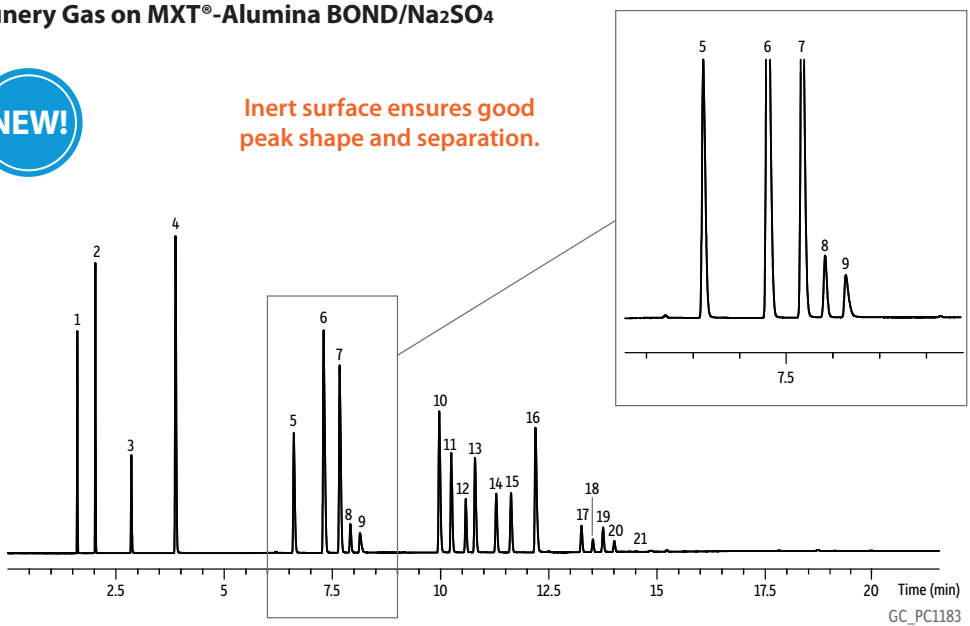
Peaks
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. *n*-Butane
8. Propadiene
9. Acetylene
10. *trans*-2-Butene
11. 1-Butene
12. Isobutylene
13. *cis*-2-Butene
14. iso-Pentane
15. *n*-Pentane
16. 1,3-Butadiene
17. *trans*-2-Pentene
18. 2-Methyl-2-butene
19. 1-Pentene
20. *cis*-2-Pentene
21. Hexanes

Column	Rt®-Alumina BOND/Na_2SO_4, 50 m, 0.53 mm ID, 10 µm (cat.# 19756)
Sample	Refinery gas
Injection	
Inj. Vol.:	10 µL split
Liner:	Taper (2 mm) (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	80 mL/min
Oven	
Oven Temp:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	74 cm/sec @ 45 °C
Detector	FID @ 200 °C

Refinery Gas on MXT®-Alumina BOND/Na_2SO_4

NEW!

Inert surface ensures good peak shape and separation.

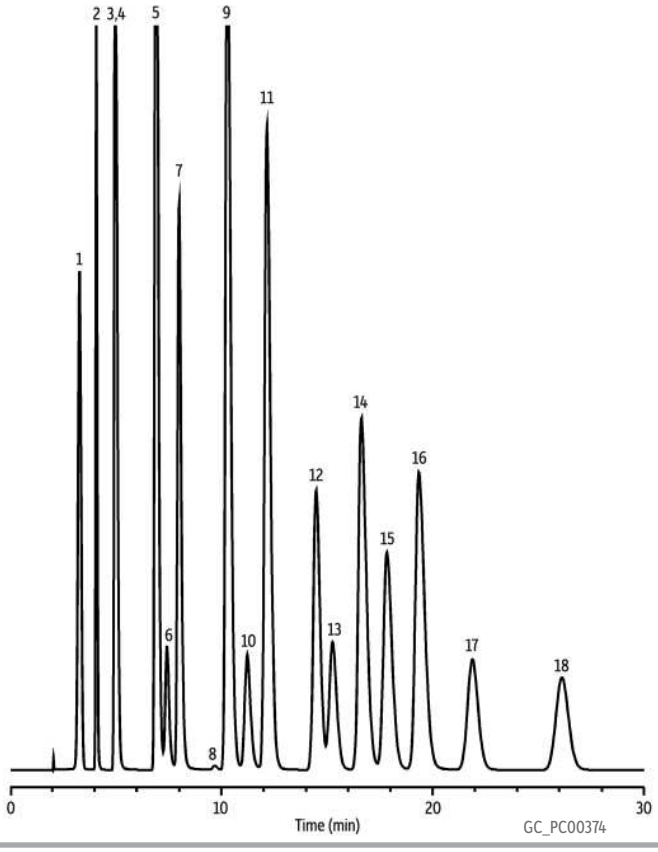


Peaks
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. *n*-Butane
8. Propadiene
9. Acetylene
10. *trans*-2-Butene
11. 1-Butene
12. Isobutylene
13. *cis*-2-Butene
14. Isopentane
15. *n*-Pentane
16. 1,3-Butadiene
17. *trans*-2-Pentene
18. 2-Methyl-2-butene
19. 1-Pentene
20. *cis*-2-Pentene
21. Hexanes

Column	MXT®-Alumina BOND/Na_2SO_4, 30 m, 0.53 mm ID, 10 µm (cat.# 79714)
Sample	Refinery gas
Injection	
Inj. Vol.:	10 µL split
Liner:	2 mm split
Inj. Temp.:	45 °C
Split Vent Flow Rate:	80 mL/min
Oven	
Oven Temp:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 8.5 min)
Carrier Gas	He, constant pressure (10 psi, 68.9 kPa)
Linear Velocity:	31 cm/sec @ 45 °C
Detector	FID @ 200 °C

Refinery Gas Calibration Standard on Refinery Gas Packed Column Set

(packed)

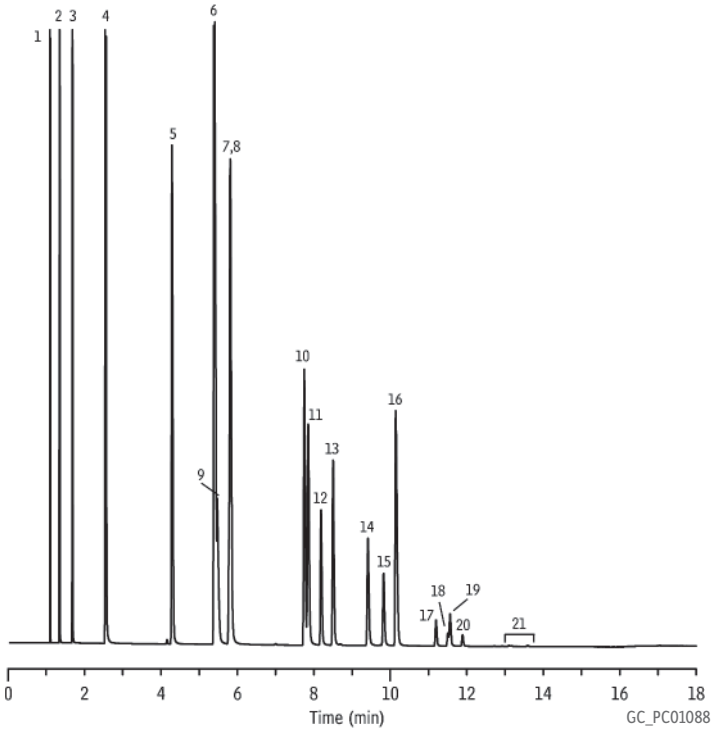


Peaks
1. C5-C6+
2. Methane
3. Ethane
4. Ethylene
5. Propane
6. Acetylene
7. Propylene
8. Cyclopropane
9. Isobutane
10. Propadiene
11. *n*-Butane
12. 1-Butene
13. Isobutene
14. *trans*-2-Butene
15. *cis*-2-Butene
16. 1,3-Butadiene
17. Isopentane
18. *n*-Pentane

Column	Refinery gas column set (3 columns): 2a 2b 2c , Silcosteel® tubing (cat.# 88000-875)
Sample	Refinery gas
Injection	
Inj. Vol.:	1,000 µL packed on-column
Inj. Temp.:	150 °C
Oven	
Oven Temp:	60 °C
Carrier Gas	He, constant flow
Flow Rate:	30 mL/min
Detector	FID @ 150 °C

Refinery Gas on Rt®-Alumina BOND/KCl

(PLOT)

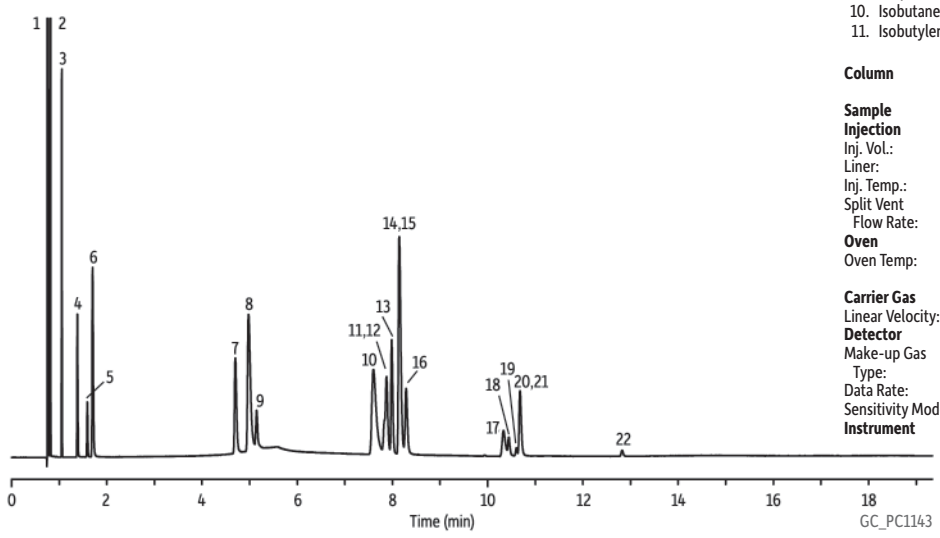


Peaks
1. Methane
2. Ethane
3. Ethylene
4. Propane
5. Propylene
6. Isobutane
7. *n*-Butane
8. Propadiene
9. Acetylene
10. *trans*-2-Butene
11. 1-Butene
12. Isobutylene
13. *cis*-2-Butene
14. Isopentane
15. *n*-Pentane
16. 1,3-Butadiene
17. *trans*-2-Pentene
18. 2-Methyl-2-butene
19. 1-Pentene
20. *cis*-2-Pentene
21. Hexanes

Column	Rt®-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (cat.# 19760)
Sample	Refinery gas standard
Injection	
Inj. Vol.:	10 µL split
Liner:	Taper (2 mm) (cat.# 20795)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	80 mL/min
Oven	
Oven Temp:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)
Carrier Gas	H_2, constant pressure (8.0 psi, 55.2 kPa)
Linear Velocity:	74 cm/sec @ 45 °C
Detector	FID @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	HP5890 GC

Refinery Gas Mixture on Rt®-QS-BOND

(PLOT)



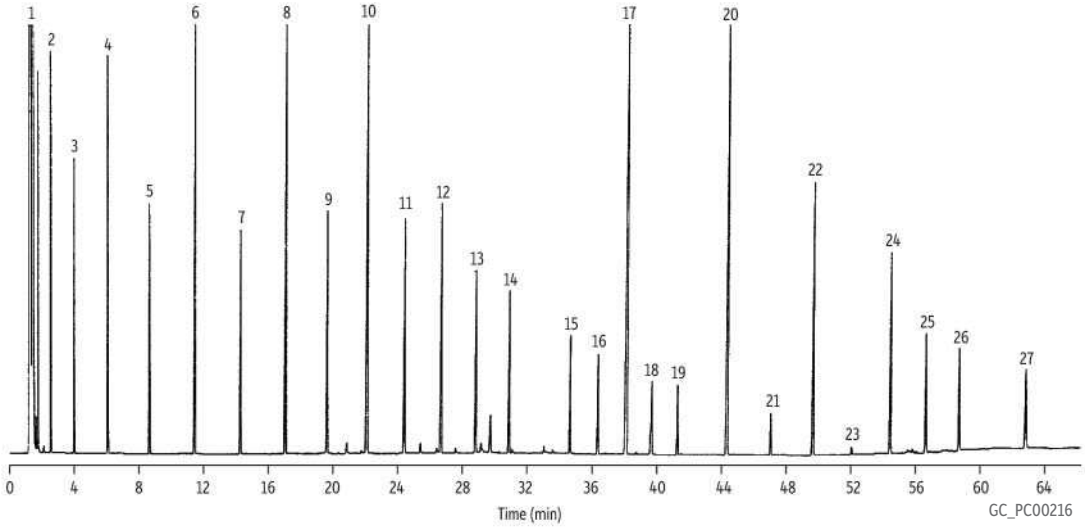
GC_PC1143

Peaks

1. Air
2. Methane
3. Carbon dioxide
4. Ethylene
5. Acetylene
6. Ethane
7. Propylene
8. Propane
9. Propadiene
10. Isobutane
11. Isobutylene
12. 1-Butene
13. 1,3-Butadiene
14. *n*-Butane
15. *cis*-2-Butene
16. *trans*-2-Butene
17. Isopentane
18. 1-Pentene
19. 2-Methyl-2-butene
20. *n*-Pentane
21. *cis*-2-Pentene
22. *n*-Hexane

Column	Rt®-QS-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19738)
Sample	Refinery gas standard
Injection	
Inj. Vol.:	20 µL split
Liner:	2 mm (cat.# 20712)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	35 mL/min
Oven	
Oven Temp:	40 °C (hold 2 min) to 225 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant pressure (11.5 psi, 79.3 kPa)
Linear Velocity:	68 cm/sec @ 40 °C
Detector	TCD @ 225 °C
Make-up Gas Type:	He
Data Rate:	20 Hz
Sensitivity Mode:	He/H_2
Instrument	HP5890 GC

Hydrocarbons (C7-C42) on Rtx®-1

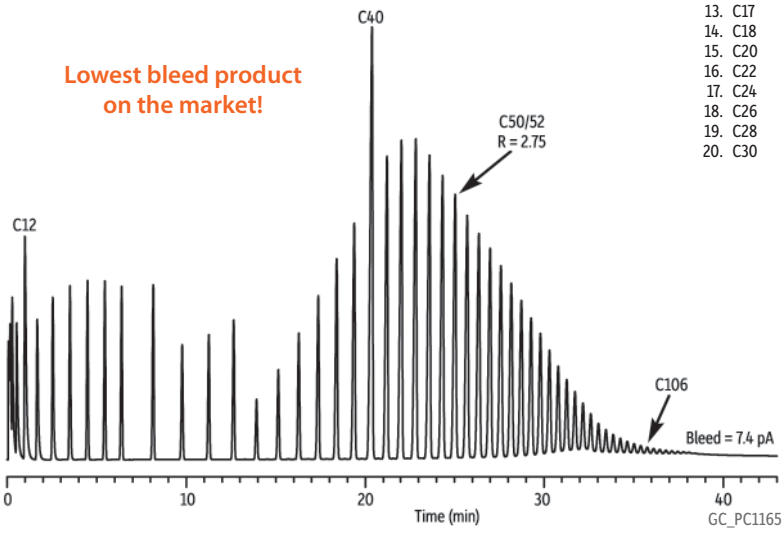


Peaks	
1.	C7
2.	C8
3.	C9
4.	C10
5.	C11
6.	C12
7.	C13
8.	C14
9.	C15
10.	C16
11.	C17
12.	C18
13.	C19
14.	C20
15.	C22
16.	C23
17.	C24
18.	C25
19.	C26
20.	C28
21.	C30
22.	C32
23.	C34
24.	C36
25.	C38
26.	C40
27.	C42

Column	Rtx®-1, 30 m, 0.53 mm ID, 0.25 µm (cat.# 10125)
Sample	Synthetic hydrocarbon mix
Conc.:	~0.1 mg/mL per component
Injection	
Inj. Vol.:	0.2 µL direct
Liner:	Uniliner®
Inj. Temp.:	340 °C
Oven	
Oven Temp:	40 °C to 340 °C at 5 °C/min
Carrier Gas	H_2, constant pressure
Linear Velocity:	40 cm/sec @ 40 °C
Detector	FID @ 340 °C
Notes	FID sensitivity: 64 x 10^{-11} AFS

Hydrocarbons (C5-C106) on MXT®-1HT SimDist at 430 °C

Lowest bleed product on the market!

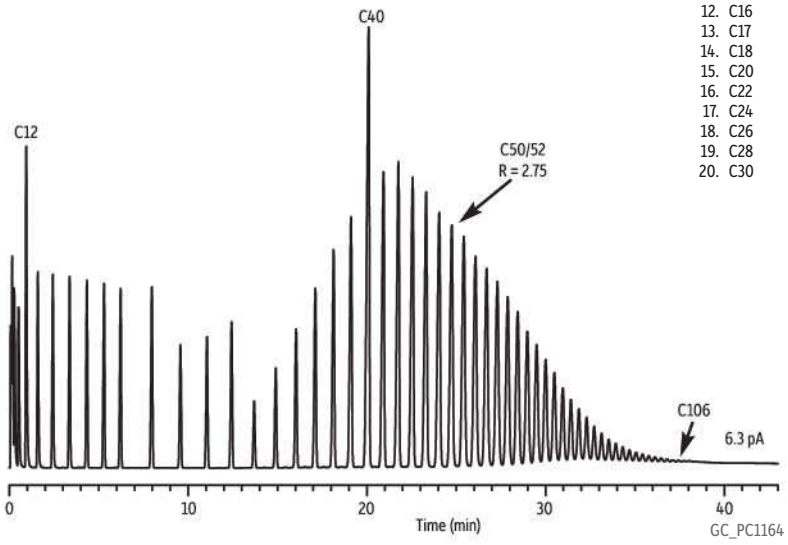


Peaks		t_R (min)	Peaks		t_R (min)	Peaks		t_R (min)
1.	C5	—	21.	C32	16.280	41.	C72	30.789
2.	C6	—	22.	C34	17.364	42.	C74	31.265
3.	C7	—	23.	C36	18.392	43.	C76	31.725
4.	C8	—	24.	C38	19.371	44.	C78	32.173
5.	C9	—	25.	C40	20.363	45.	C80	32.609
6.	C10	—	26.	C42	21.199	46.	C82	33.033
7.	C11	—	27.	C44	22.041	47.	C84	33.454
8.	C12	0.988	28.	C46	22.843	48.	C86	33.858
9.	C13	1.677	29.	C48	23.609	49.	C88	34.256
10.	C14	2.544	30.	C50	24.340	50.	C90	34.643
11.	C15	3.503	31.	C52	25.041	51.	C92	35.024
12.	C16	4.484	32.	C54	25.712	52.	C94	35.395
13.	C17	5.451	33.	C56	26.365	53.	C96	35.758
14.	C18	6.386	34.	C58	26.990	54.	C98	36.115
15.	C20	8.15	35.	C60	27.594	55.	C100	36.460
16.	C22	9.764	36.	C62	28.173	56.	C102	36.803
17.	C24	11.259	37.	C64	28.733	57.	C104	37.139
18.	C26	12.645	38.	C66	29.274	58.	C106	37.465
19.	C28	13.920	39.	C68	29.797			
20.	C30	15.134	40.	C70	30.303			

Column	MXT®-1HT SimDist, 5 m, 0.53 mm ID, 0.10 µm (cat.# 70112)
Sample	Custom C5-C106 hydrocarbon standard
Diluent:	Carbon disulfide
Conc.:	1%
Injection	
Inj. Vol.:	0.5 µL cold on-column
Temp. Program:	53 °C to 430 °C at 10 °C/min (hold 5 min)
Oven	
Oven Temp:	50 °C to 430 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	18 mL/min
Detector	FID @ 430 °C
Make-up Gas Flow Rate:	24 mL/min
Constant Column + Constant Make-up:	42 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Shimadzu 2010 GC

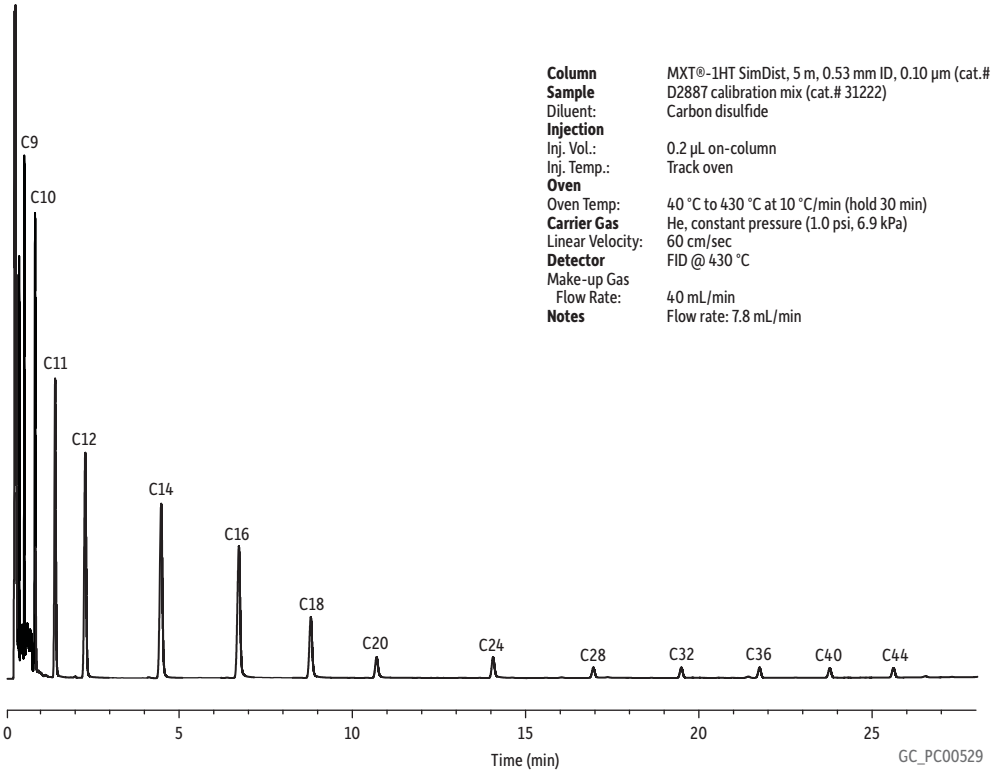
Hydrocarbons (C5-C106) on MXT®-1HT SimDist at 450 °C

Peaks	t_R (min)	Peaks	t_R (min)	Peaks	t_R (min)
1. C5	—	21. C32	16.035	41. C72	30.489
2. C6	—	22. C34	17.110	42. C74	30.906
3. C7	—	23. C36	18.133	43. C76	31.414
4. C8	—	24. C38	19.108	44. C78	31.862
5. C9	—	25. C40	20.096	45. C80	32.294
6. C10	—	26. C42	20.923	46. C82	32.719
7. C11	—	27. C44	21.759	47. C84	33.132
8. C12	0.938	28. C46	22.556	48. C86	33.529
9. C13	1.586	29. C48	23.317	49. C88	33.927
10. C14	2.425	30. C50	24.051	50. C90	34.310
11. C15	3.365	31. C52	24.752	51. C92	34.689
12. C16	4.332	32. C54	25.422	52. C94	35.059
13. C17	5.290	33. C56	26.079	53. C96	35.423
14. C18	6.217	34. C58	26.701	54. C98	35.773
15. C20	7.966	35. C60	27.305	55. C100	36.120
16. C22	9.566	36. C62	27.878	56. C102	36.463
17. C24	11.051	37. C64	28.439	57. C104	36.793
18. C26	12.426	38. C66	28.975	58. C106	37.118
19. C28	13.689	39. C68	29.499		
20. C30	14.897	40. C70	30.002		



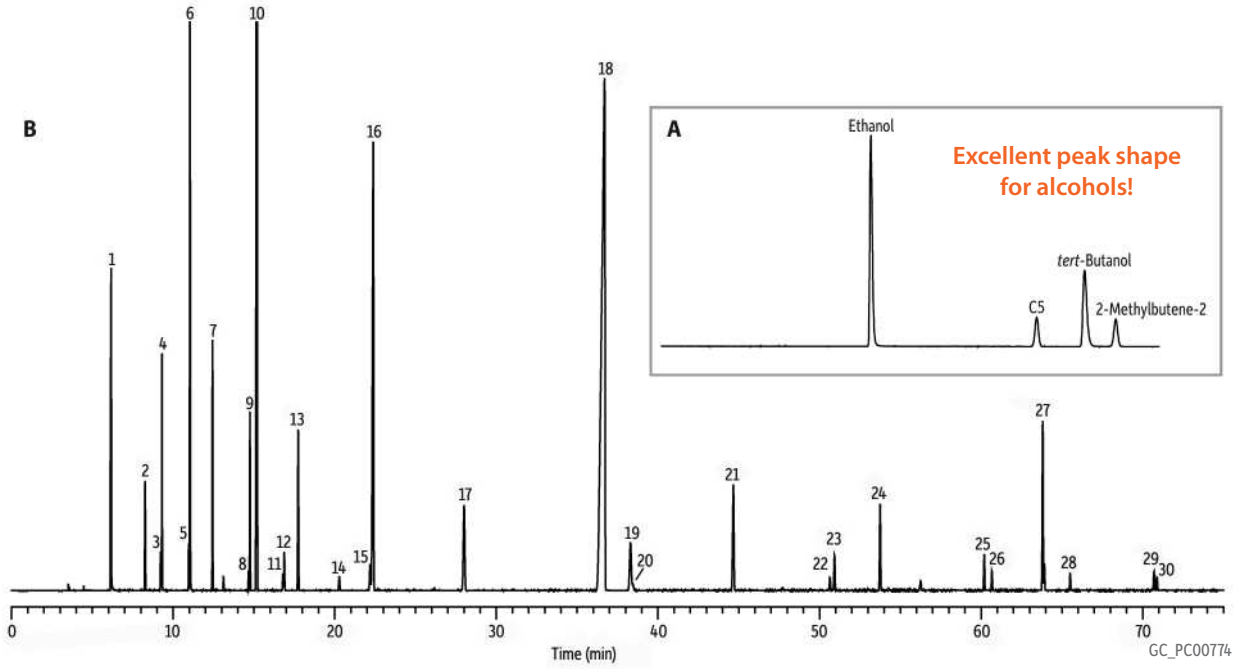
Column	MXT®-1HT SimDist, 5 m, 0.53 mm ID, 0.10 µm (cat.# 70112)
Sample	Custom C5-C106 hydrocarbon standard
Diluent:	Carbon disulfide
Conc.:	1%
Injection	
Inj. Vol.:	0.5 µL cold on-column
Temp. Program:	53 °C to 450 °C at 10 °C/min (hold 5 min)
Oven	
Oven Temp:	50 °C to 450 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	18 mL/min
Detector	FID @ 450 °C
Make-up Gas Flow Rate:	24 mL/min
Constant Column + Constant Make-up:	42 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Shimadzu 2010 GC

Hydrocarbons (C10-C44) on MXT®-1HT SimDist



Column	MXT®-1HT SimDist, 5 m, 0.53 mm ID, 0.10 µm (cat.# 70100)
Sample	D2887 calibration mix (cat.# 31222)
Diluent:	Carbon disulfide
Injection	
Inj. Vol.:	0.2 µL on-column
Inj. Temp.:	Track oven
Oven	
Oven Temp:	40 °C to 430 °C at 10 °C/min (hold 30 min)
Carrier Gas	He, constant pressure (1.0 psi, 6.9 kPa)
Linear Velocity:	60 cm/sec
Detector	FID @ 430 °C
Make-up Gas Flow Rate:	40 mL/min
Notes	Flow rate: 7.8 mL/min

Fast Detailed Hydrocarbons Analysis (DHA) Analyzed Using ASTM Method on Rtx®-DHA-100/Rtx®-5 DHA



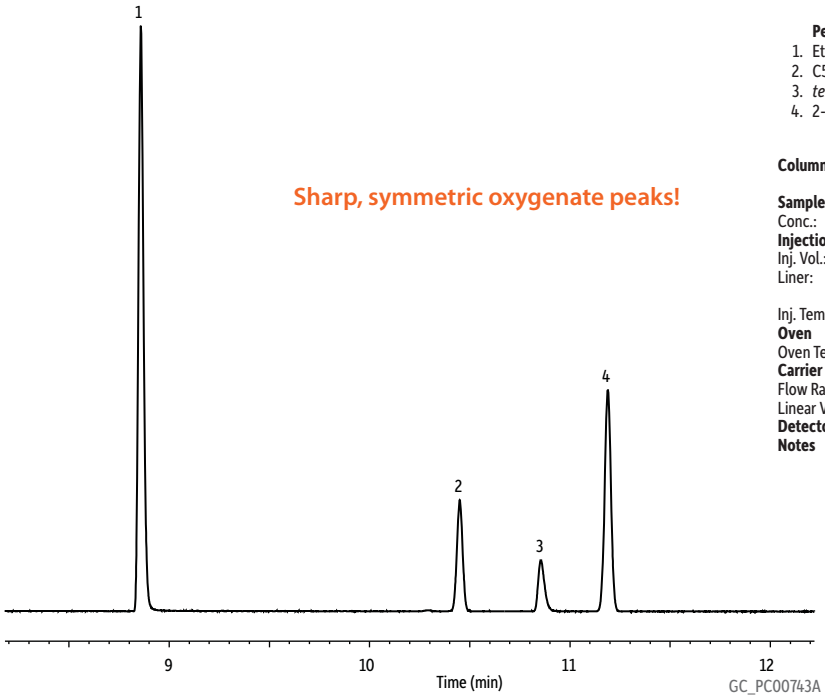
Peaks
1. Ethanol
2. C5
3. *tert*-Butanol
4. 2-Methylbutene-2
5. 2,3-Dimethylbutane
6. Methyl *tert*-butyl ether (MTBE)
7. C6
8. 1-Methylcyclopentene
9. Benzene
10. Cyclohexane
11. 3-Ethylpentane
12. 1,2-Dimethylcyclopentane
13. C7
14. 2,2,3-Trimethylpentane
15. 2,3,3-Trimethylpentane
16. Toluene
17. C8
18. Ethylbenzene
19. *p*-Xylene
20. 2,3-Dimethylheptane
21. C9
22. 5-Methylnonane
23. 1,2-Methylethylbenzene
24. C10
25. C11
26. 1,2,3,5-Tetramethylbenzene
27. Naphthalene
28. C12
29. 1-Methylnaphthalene
30. C13

Column	Rtx®-DHA-100, 100 m, 0.25 mm ID, 0.50 µm (cat.# 10148) using Rtx®-5 DHA tuning column 5 m, 0.25 mm ID
Sample	DHA/oxygenates setup blend (see notes)
Injection	
Inj. Vol.:	0.01 µL split (split ratio 150:1)
Liner:	4 mm cup splitter inlet liner with Siltek® deactivation (cat.# 20709-214.1)
Inj. Temp.:	250 °C
Oven	
Carrier Gas	H_2, constant flow
Flow Rate:	3.62 mL/min
Linear Velocity:	55 cm/sec
Detector	FID @ 300 °C
Oven Temp	A: 35 °C B: 5 °C (hold 8.32 min) (elute C5) to 48 °C at 22 °C/min (hold 26.32 min) (elute ethylbenzene) to 141 °C at 3.20 °C/min (elute C12) to 300 °C at 1 °C/min
Notes	A: Front end of DHA/oxygenates set-up blend C5 Efficiency: 586,825 plates C5 k': 0.476 *tert*-Butanol skew: 2.10 Resolution: *tert*-butanol/2-methylbutene-2: 5.39
Acknowledgement	Chromatogram courtesy of Neil Johansen, Inc., Aztec, New Mexico, in association with Envantage Analytical Software, Inc., Cleveland, Ohio.

	Optimized D6730 with hydrogen*	Optimized D6730 with helium*	Standard D6730 conditions
Approximate analysis time	72 min.	98 min.	146 min.
% Time savings (relative to standard method conditions)	51% faster	33% faster	—

* Optimized conditions and chromatographic results for hydrogen shown above; for helium, see next page.

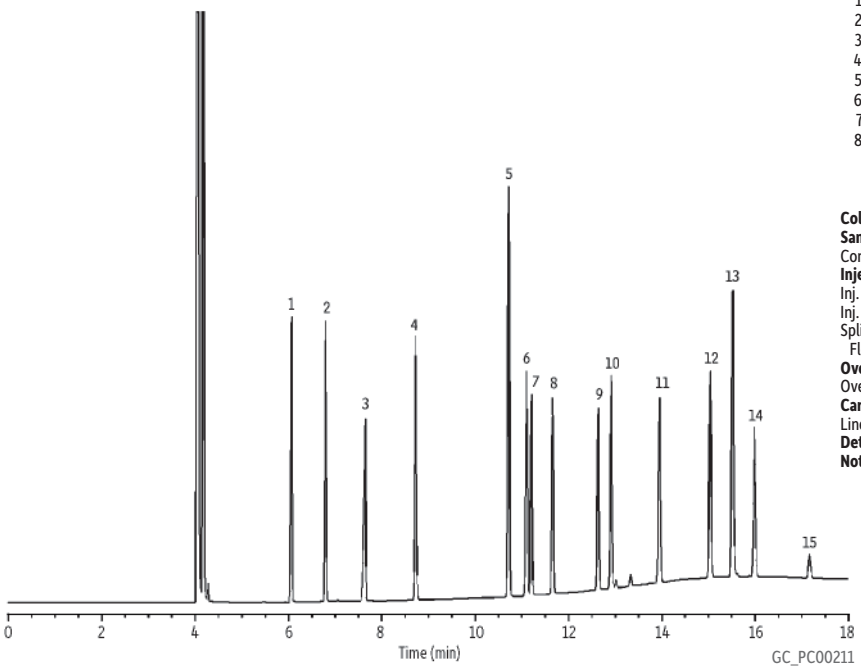
Detailed Hydrocarbon Analysis on Rtx®-DHA-100/Rtx®-5 DHA Tuning Column



Peaks
1. Ethanol
2. C5
3. *tert*-Butanol
4. 2-Methylbutene-2

Column	Rtx®-DHA-100, 100 m, 0.25 mm ID, 0.50 µm (cat.# 10148) using Rtx®-5 DHA tuning column, 2.62 m, 0.25 mm ID, 1.0 µm
Sample	Custom detailed hydrocarbon analysis (DHA) mix
Conc.:	Neat
Injection	
Inj. Vol.:	0.01 µL split (split ratio 150:1)
Liner:	4 mm cup splitter inlet liner with Siltek® deactivation (cat.# 20709-214.1)
Inj. Temp.:	200 °C
Oven	
Oven Temp:	35 °C
Carrier Gas	He, constant flow
Flow Rate:	2.3 mL/min
Linear Velocity:	28 cm/sec
Detector	FID @ 250 °C
Notes	C5 efficiency: 613,596 total theoretical plates k' (C5): 0.489 *tert*-butanol skewness: 1.25 Resolution (*tert*-butanol/2-methylbutene-2): 5.60

Aromatics on Rt®-TCEP



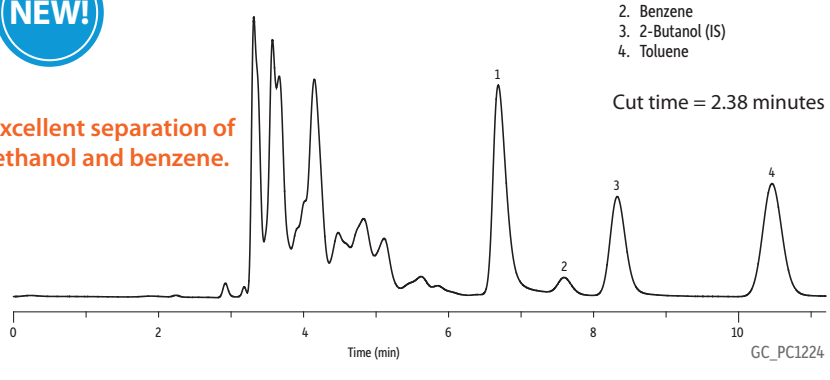
Peaks
1. *n*-Undecane
2. Benzene
3. *n*-Dodecane
4. Toluene
5. Ethylbenzene
6. *p*-Xylene
7. *m*-Xylene
8. Cumene
9. *n*-Propylbenzene
10. *o*-Xylene
11. Mesitylene
12. 1-Ethyl-2-methylbenzene
13. *m*-Diethylbenzene
14. *p*-Diethylbenzene
15. *o*-Diethylbenzene

Column	Rt®-TCEP, 60 m, 0.25 mm ID, 0.40 µm (cat.# 10999)
Sample	
Conc.:	500 ppm, except ethylbenzene @ 1,000 ppm
Injection	
Inj. Vol.:	1.0 µL split
Inj. Temp.:	200 °C
Split Vent	
Flow Rate:	46 mL/min
Oven	
Oven Temp:	60 °C (hold 5 min) to 100 °C at 5 °C/min (hold 10 min)
Carrier Gas	He, constant pressure
Linear Velocity:	30 cm/sec @ 80 °C
Detector	FID @ 200 °C
Notes	FID sensitivity: 6.4 x 10^{-11} AFS

Gasoline Containing Ethanol on D3606 Application Column Set by ASTM D3606-10 (Modified)

NEW!

Excellent separation of ethanol and benzene.



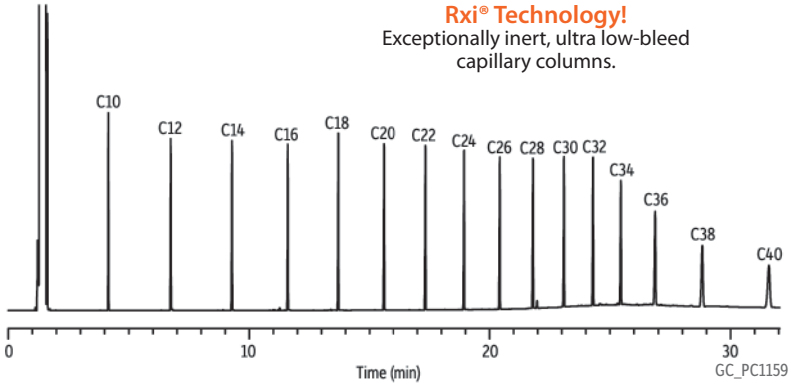
Peaks
1. Ethanol
2. Benzene
3. 2-Butanol (IS)
4. Toluene

Cut time = 2.38 minutes

Column	D3606 application column (2 column set). Column 1: 6' (1.8 m), 1/8" OD, 2.0 mm ID, nonpolar Rtx®-1; Column 2: 16' (4.9 m), 1/8" OD, 2.0 mm ID, proprietary packing material (cat.# 83606-800)
Sample	Ethanol-containing gasoline with internal standard (IS)
Diluent:	
Injection	Sample valve
Sample Loop Vol.:	1.5 µL
Valve Temp.:	150 °C
Oven	
Oven Temp:	135 °C (hold 12 min)
Carrier Gas	He, constant flow
Flow Rate:	20.0 mL/min
Detector	TCD @ 200 °C
Notes	2.38 minute backflush (must be determined for each GC system).

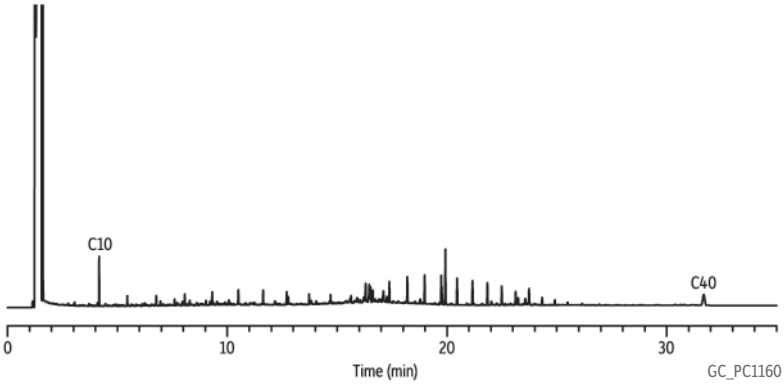
C10-C40 Alkanes on Rxi®-5HT

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.



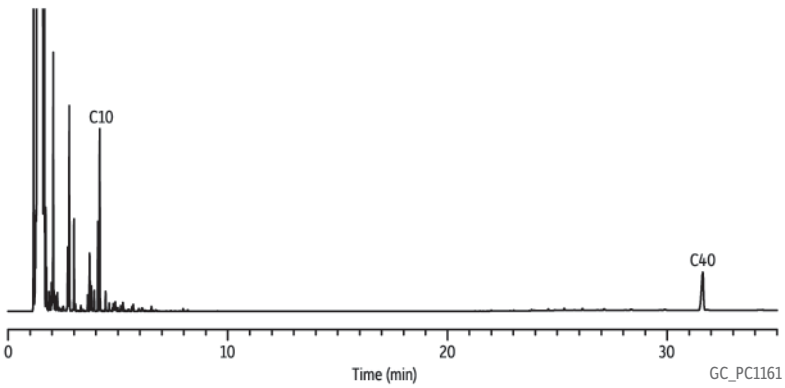
Column	Rxi®-5HT, 30 m, 0.32 mm ID, 0.25 µm (cat.# 13924) using Rxi® guard column 2 m, 0.53 mm ID (cat.# 10054)
Sample	System performance test standard mixture of *n*-alkanes (cat.# 31678)
Diluent:	Hexane
Conc.:	50 µg/mL
Injection	
Inj. Vol.:	1 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	1.25 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC

Diesel on Rxi®-5HT



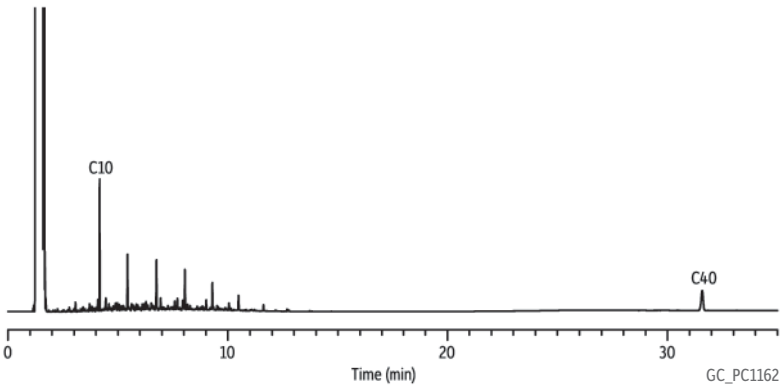
Column	Rxi®-5HT, 30 m, 0.32 mm ID, 0.25 µm (cat.# 13924) using Rxi® guard column 2 m, 0.53 mm ID (cat.# 10054)
Sample	Diesel fuel #2 composite (cat.# 31258)
Diluent:	Methylene chloride
Conc.:	50,000 µg/mL diluted to 500 ppm and spiked with C10 & C40
Injection	
Inj. Vol.:	1 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	1.25 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC

Gasoline on Rxi®-5HT



Column	Rxi®-5HT, 30 m, 0.32 mm ID, 0.25 µm (cat.# 13924) using Rxi® guard column 2 m, 0.53 mm ID (cat.# 10054)
Sample	Unleaded gasoline composite (cat.# 30081)
Diluent:	Methanol
Conc.:	2,500 µg/mL diluted to 500 ppm and spiked with C10 & C40
Injection	
Inj. Vol.:	1 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	1.25 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC

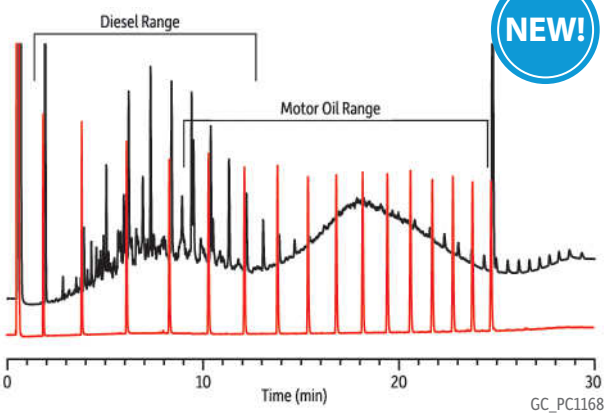
Kerosene on Rxi®-5HT



Column	Rxi®-5HT, 30 m, 0.32 mm ID, 0.25 µm (cat.# 13924) using Rxi® guard column 2 m, 0.53 mm ID (cat.# 10054)
Sample	Kerosene composite (cat.# 31094)
Diluent:	Methylene chloride
Conc.:	500 µg/mL spiked with C10 & C40
Injection	
Inj. Vol.:	1 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	1.25 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC

Diesel #2/Motor Oil on Rtx®-Mineral Oil

NEW!

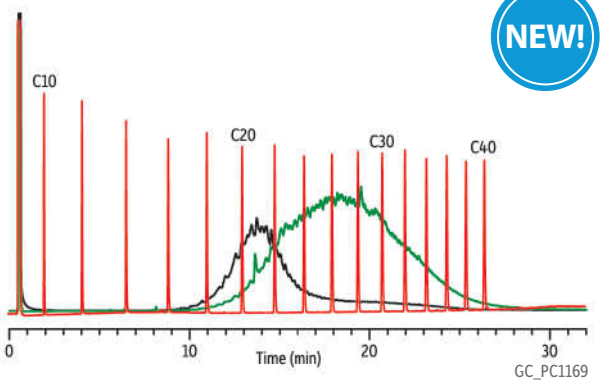


GC_PC1168

Column	Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.15 µm (cat.# 18074) using IP deactivated guard column 2 m, 0.53 mm ID (cat.# 10047)
Sample	Diesel #2/motor oil (cat.# 31682)
Diluent:	Hexane
Conc.:	5,000 µg/mL diluted to 500 ppm
Injection	
Inj. Vol.:	0.5 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	0.625 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC
Notes	Black trace = diesel/motor oil Red trace = C10-C40 standard

Mineral Oil and Motor Oil on Rtx®-Mineral Oil

NEW!

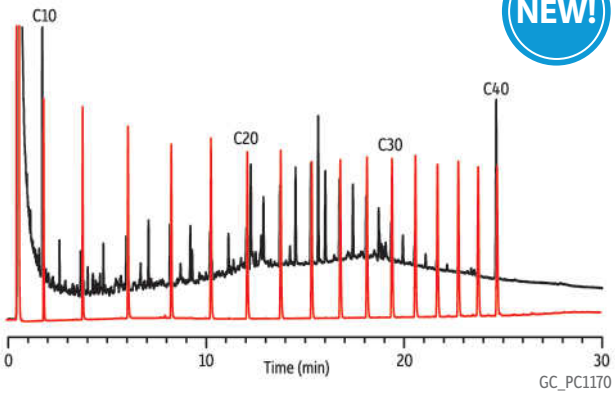


GC_PC1169

Column	Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.15 µm (cat.# 18074) using IP deactivated guard column 2 m, 0.53 mm ID (cat.# 10047)
Sample	Custom mineral oil/motor oil mix
Diluent:	Hexane
Conc.:	500 µg/mL
Injection	
Inj. Vol.:	0.5 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	0.625 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC
Notes	Black trace = mineral oil Green trace = motor oil Red trace = C10-C40 standard

Diesel #2/Mineral Oil on Rtx®-Mineral Oil

NEW!



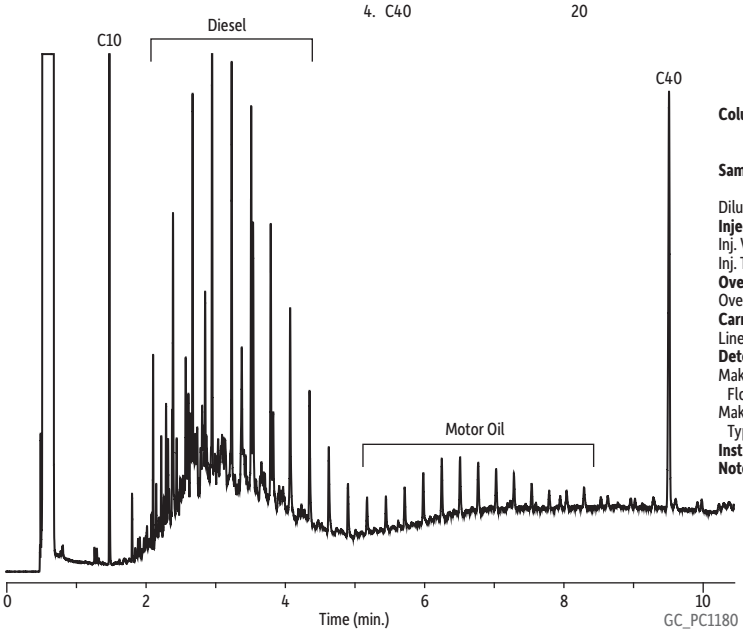
GC_PC1170

Column	Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.15 µm (cat.# 18074) using IP deactivated guard column 2 m, 0.53 mm ID (cat.# 10047)
Sample	Diesel #2/mineral oil (cat.# 31676)
Diluent:	Hexane
Conc.:	500 µg/mL
Injection	
Inj. Vol.:	0.5 µL cold on-column
Temp. Program:	53 °C to 300 °C at 10 °C/min (hold 20 min)
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 20 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec @ 50 °C
Dead Time:	0.625 min @ 50 °C
Detector	FID @ 330 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Instrument	Agilent/HP6890 GC
Notes	Black trace = diesel/mineral oil Red trace = C10-C40 standard

Diesel & Motor Oil on Rtx®-Mineral Oil

NEW!

Peaks	Conc. (µg/mL)
1. C10	20
2. Diesel	500
3. Motor oil	500
4. C40	20



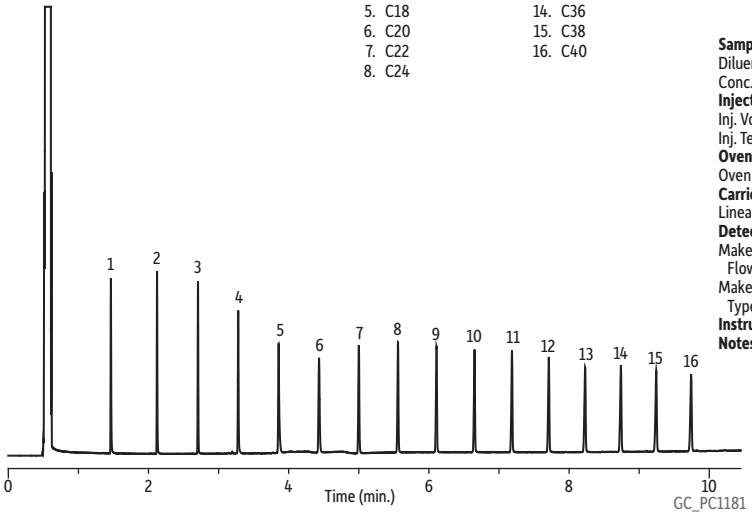
GC_PC1180

Column	Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.10 µm (cat.# 18079) using IP deactivated guard column 10 m, 0.32 mm ID (cat.# 10047) with aluminum connector
Sample	Diesel #2/motor oil (cat.# 31682) Extraction solvent stock solution #2 (cat.# 31680)
Diluent:	Hexane/methylene chloride
Injection	
Inj. Vol.:	1.0 µL direct
Inj. Temp.:	58 °C
Oven	
Oven Temp:	55 °C (hold 1.0 min) to 380 °C at 100 °C/min (hold 6.0 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec
Detector	FID @ 380 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	Direct cool on-column injection, programmed by oven tracking. Actual guard column length used in application was 2 m.

n-alkanes (C10-C40) on Rtx®-Mineral Oil

NEW!

Peaks	
1. C10	9. C26
2. C12	10. C28
3. C14	11. C30
4. C16	12. C32
5. C18	13. C34
6. C20	14. C36
7. C22	15. C38
8. C24	16. C40

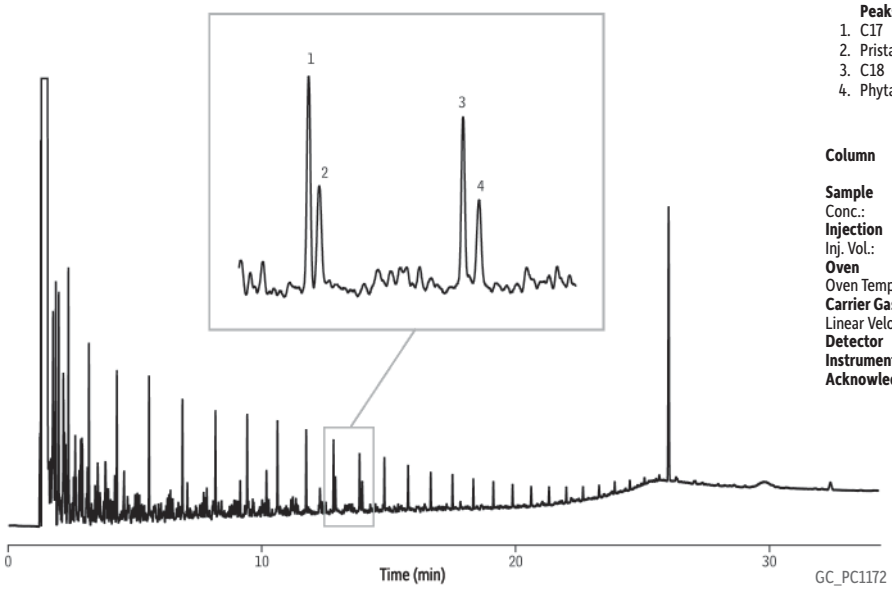


GC_PC1181

Column	Rtx®-Mineral Oil, 15 m, 0.32 mm ID, 0.10 µm (cat.# 18079) using IP deactivated guard column 10 m, 0.32 mm ID (cat.# 10047) with aluminum connector
Sample	System performance test standard mixture of *n*-alkanes (cat.# 31678)
Diluent:	Hexane/methylene chloride
Conc.:	20 µg/mL each
Injection	
Inj. Vol.:	1.0 µL direct
Inj. Temp.:	58 °C
Oven	
Oven Temp:	55 °C (hold 1.0 min) to 380 °C at 100 °C/min (hold 6.0 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec
Detector	FID @ 380 °C
Make-up Gas Flow Rate:	30 mL/min
Make-up Gas Type:	N_2
Instrument	Agilent/HP6890 GC
Notes	Direct cool on-column injection, programmed by oven tracking. Actual guard column length used in application was 2 m.

Mid-range Crude on Rxi®-5HT

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.



GC_PC1172

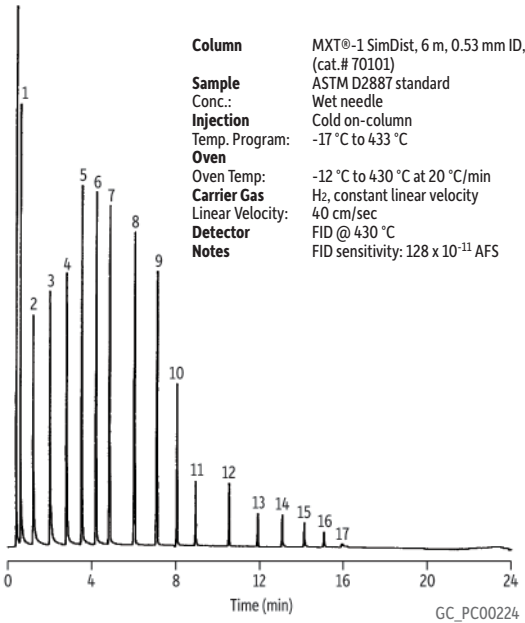
Peaks
1. C17
2. Pristane
3. C18
4. Phytane

Column	Rxi®-5HT, 30 m, 0.32 mm ID, 0.10 µm (cat.# 13909) using retention gap 2 m, 0.53 mm ID
Sample	Mid-range crude
Conc.:	500 µg/mL
Injection	
Inj. Vol.:	1.0 µL cold on-column
Oven	
Oven Temp:	50 °C to 300 °C at 10 °C/min (hold 10 min)
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec
Detector	FID @ 330 °C
Instrument	Agilent/HP6890 GC
Acknowledgement	
	Sample courtesy of Exxon Mobil Corporation

Simulated Distillation (Standard Calibration) on MXT®-1 SimDist

Peaks
1. C6
2. C7
3. C8
4. C9
5. C10
6. C11
7. C12
8. C14
9. C16
10. C18
11. C20
12. C24
13. C28
14. C32
15. C36
16. C40
17. C44

Column	MXT®-1 SimDist, 6 m, 0.53 mm ID, 0.15 µm (cat.# 70101)
Sample	ASTM D2887 standard
Conc.:	Wet needle
Injection	Cold on-column
Temp. Program:	-17 °C to 433 °C
Oven	
Oven Temp:	-12 °C to 430 °C at 20 °C/min
Carrier Gas	H_2, constant linear velocity
Linear Velocity:	40 cm/sec
Detector	FID @ 430 °C
Notes	FID sensitivity: 128 x 10^{-11} AFS

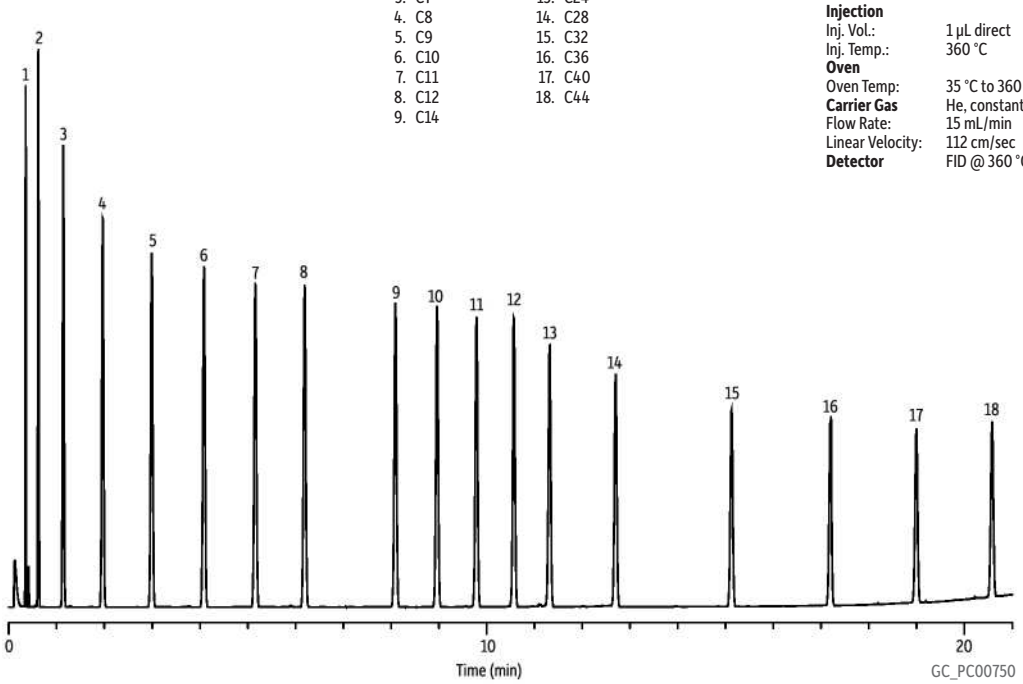


GC_PC00224

Simulated Distillation (C5-C44) on Rtx®-2887

Peaks
1. C5
2. C6
3. C7
4. C8
5. C9
6. C10
7. C11
8. C12
9. C14
10. C16
11. C18
12. C20
13. C24
14. C28
15. C32
16. C36
17. C40
18. C44

Column	Rtx®-2887, 10 m, 0.53 mm ID, 2.65 µm (cat.# 10199)
Sample	C5 to C44 hydrocarbon standard
Diluent:	Carbon disulfide
Conc.:	0.01-0.1 wt. %
Injection	
Inj. Vol.:	1 µL direct
Inj. Temp.:	360 °C
Oven	
Oven Temp:	35 °C to 360 °C at 15 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	15 mL/min
Linear Velocity:	112 cm/sec
Detector	FID @ 360 °C

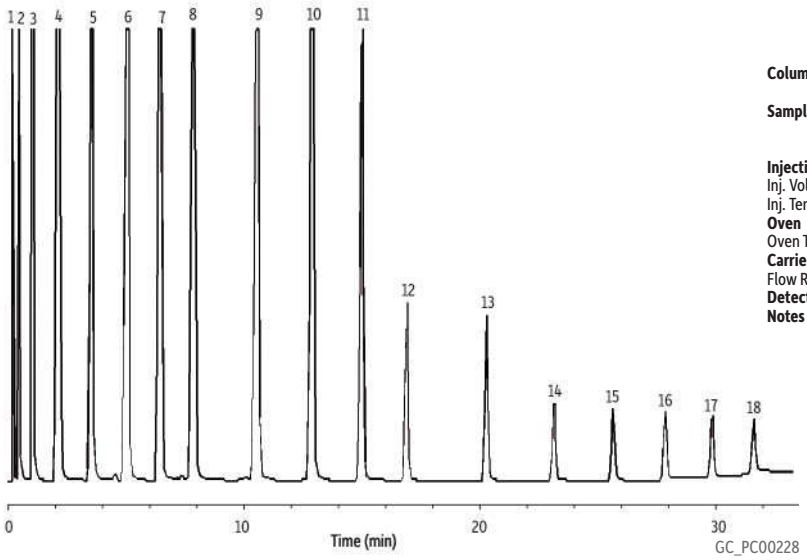


GC_PC00750

Hydrocarbons (Simulated Distillation)

Simulated Distillation by ASTM D2887 on Rtx®-1 SimDist 2887

(packed)



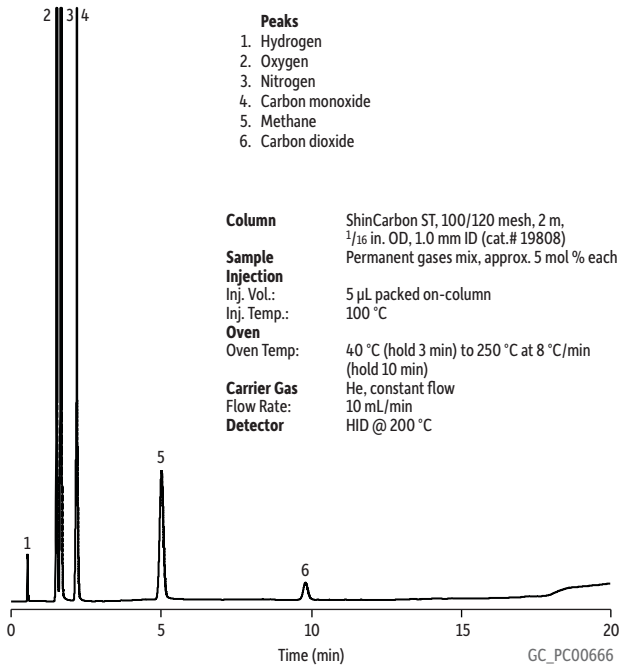
Peaks

1. Pentane
2. Hexane
3. Heptane
4. Octane
5. Nonane
6. Decane
7. Undecane
8. Dodecane
9. Tetradecane
10. Hexadecane
11. Octadecane
12. Eicosane
13. Tetracosane
14. Octacosane
15. Dotricontane
16. Hexatriacontane
17. Tetracontane
18. Tetratetracontane

Column	Rtx®-1 SimDist 2887, SilcoSmooth® tubing, 100/120 mesh on Silcoport® W, 25 inches, 1/8 in. OD, 2 mm ID (cat.# 80000-800)
Sample	1-12% (w/w) each component ASTM D2887-01 calibration mix (1% each in CS_2) (cat.# 31674) ASTM D2887-01 calibration mix (5% each, neat) (cat.# 31675)
Injection	
Inj. Vol.:	1.0 µL packed not on-column
Inj. Temp.:	350 °C
Oven	
Oven Temp:	35 °C to 350 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	25 mL/min
Detector	FID @ 350 °C
Notes	FID sensitivity: 256 x 10^{-11} AFS

Permanent Gases on ShinCarbon ST

(micropacked)

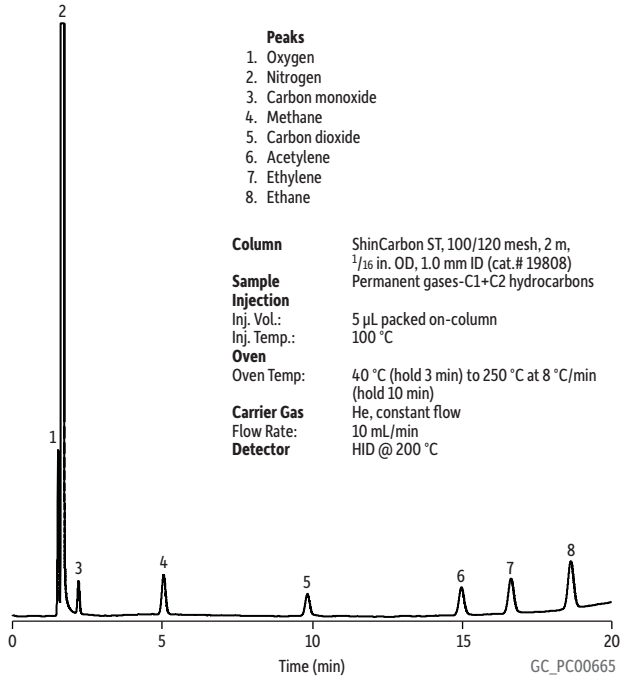


Peaks
1. Hydrogen
2. Oxygen
3. Nitrogen
4. Carbon monoxide
5. Methane
6. Carbon dioxide

Column	ShinCarbon ST, 100/120 mesh, 2 m, 1/16 in. OD, 1.0 mm ID (cat.# 19808)
Sample	Permanent gases mix, approx. 5 mol % each
Injection	
Inj. Vol.:	5 µL packed on-column
Inj. Temp.:	100 °C
Oven	
Oven Temp:	40 °C (hold 3 min) to 250 °C at 8 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	HID @ 200 °C

Permanent Gases and C1+C2 Hydrocarbons on ShinCarbon ST

(micropacked)



Peaks
1. Oxygen
2. Nitrogen
3. Carbon monoxide
4. Methane
5. Carbon dioxide
6. Acetylene
7. Ethylene
8. Ethane

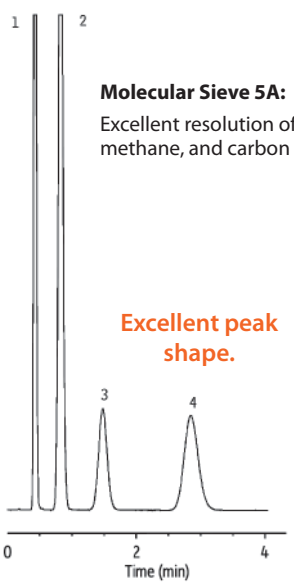
Column	ShinCarbon ST, 100/120 mesh, 2 m, 1/16 in. OD, 1.0 mm ID (cat.# 19808)
Sample	Permanent gases-C1+C2 hydrocarbons
Injection	
Inj. Vol.:	5 µL packed on-column
Inj. Temp.:	100 °C
Oven	
Oven Temp:	40 °C (hold 3 min) to 250 °C at 8 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Flow Rate:	10 mL/min
Detector	HID @ 200 °C

Permanent Gases on Molecular Sieve 5A and Molecular Sieve 13X

(packed)

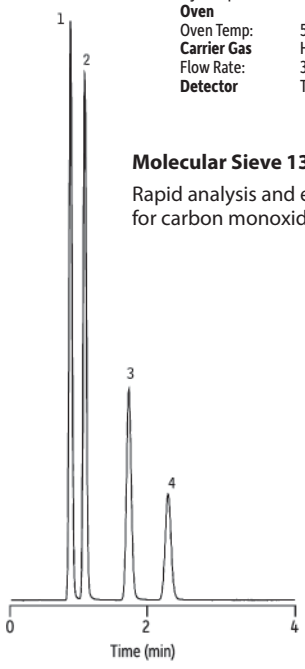
Peaks
1. Oxygen
2. Nitrogen
3. Methane
4. Carbon monoxide

Columns	Molesieve 5A 1 m, 2 mm ID (cat.# 80440-800) and Molesieve 13X 2 m, 2 mm ID (cat.# 80439-800)
Sample	5-10% each component balance helium
Injection	
Inj. Vol.:	10 µL direct
Inj. Temp.:	150 °C
Oven	
Oven Temp:	50 °C
Carrier Gas	H_2, constant flow
Flow Rate:	30 mL/min
Detector	TCD @ 200 °C



Molecular Sieve 5A:

Excellent resolution of oxygen, nitrogen, methane, and carbon monoxide.



Molecular Sieve 13X:

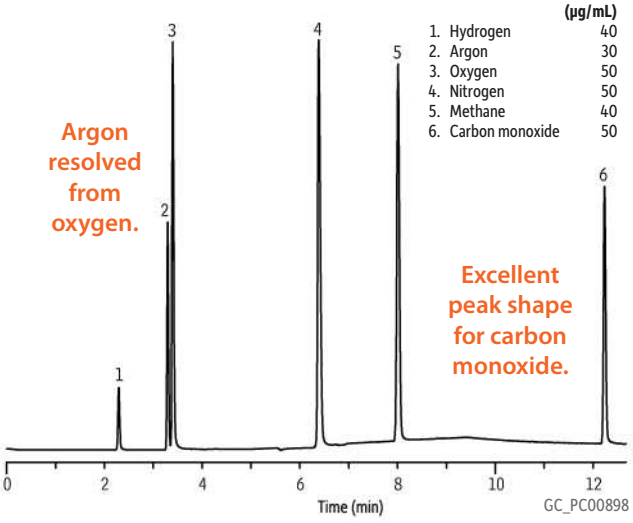
Rapid analysis and excellent peak symmetry for carbon monoxide.

GC_PC00166

Permanent Gases on Rt®-Msieve 5A

(PLOT)

Peaks	Conc. (µg/mL)
1. Hydrogen	40
2. Argon	30
3. Oxygen	50
4. Nitrogen	50
5. Methane	40
6. Carbon monoxide	50

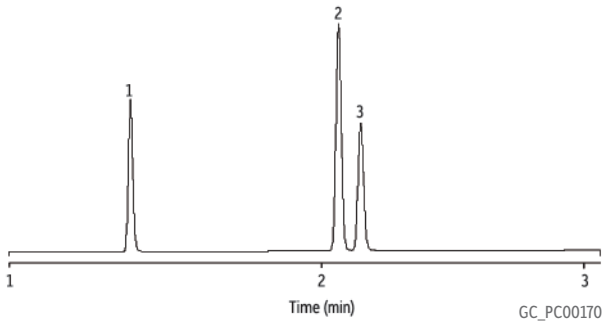


Column	Rt®-Msieve 5A, 30 m, 0.53 mm ID, 50 µm (cat.# 19723)
Sample	Permanent gases
Injection	Sample valve
Sample Loop Vol.:	5 µL
Valve Name:	6-port Valco® valve
Inj. Temp.:	200 °C
Valve Temp.:	Ambient
Oven	
Oven Temp:	27 °C (hold 5 min) to 100 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	5.0 mL/min
Detector	Valco® helium ionization detector @ 150 °C

Permanent Gases on Rt®-MSieve 5A

(PLOT)

Peaks	Conc.
1. Hydrogen	29.1 ppm
2. Argon	53.4 ppm
3. Oxygen	31.3 ppm

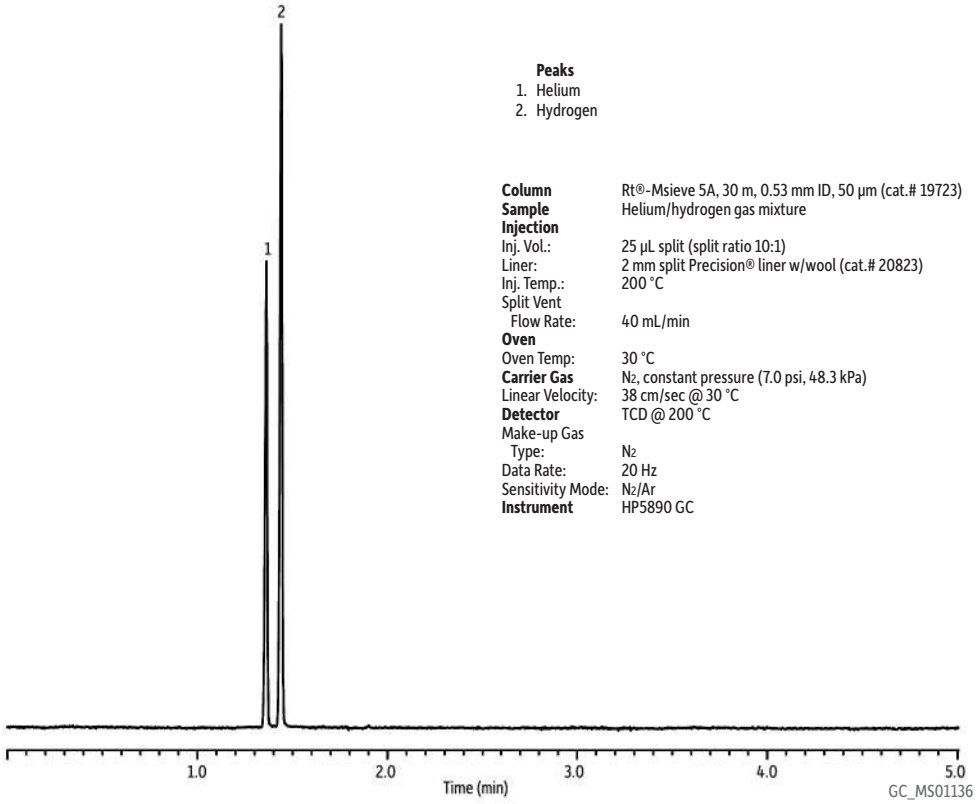


Column	Rt®-Msieve 5A, 30 m, 0.53 mm ID, 50 µm (cat.# 19723)
Injection	Sample valve
Sample Loop Vol.:	500 µL
Oven	
Oven Temp:	27 °C
Carrier Gas	He, constant flow
Linear Velocity:	34 cm/sec
Detector	Valco® HID
Acknowledgement	Chromatogram courtesy of Larry McElmurry, Mobile Analytical Labs.

Helium/Hydrogen Separation using Rt®-Msieve 5A

(PLOT)

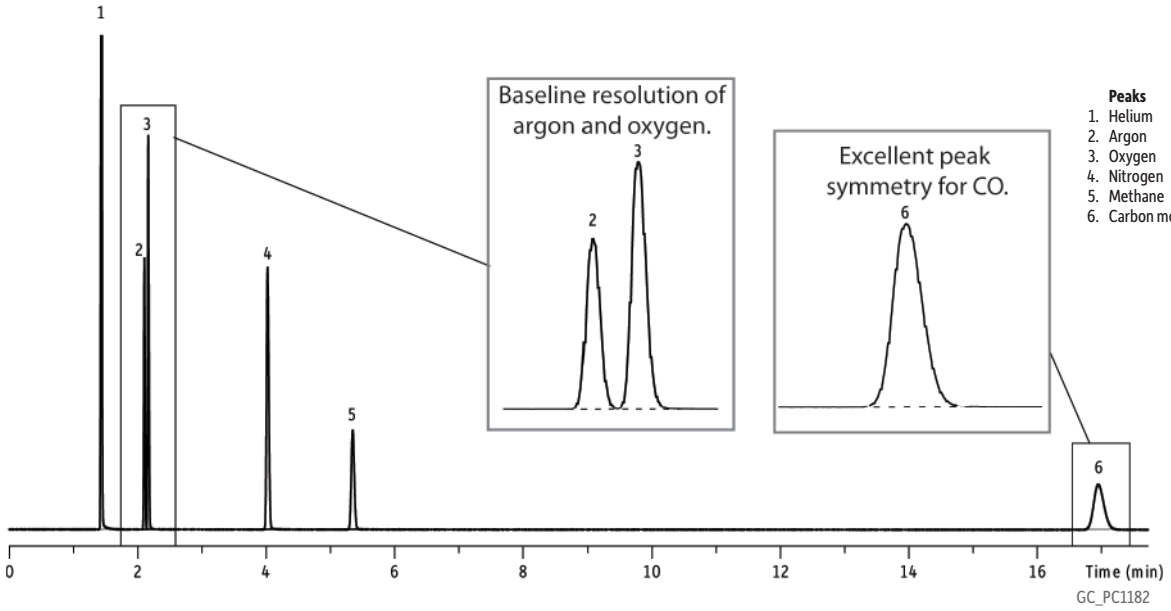
Peaks
1. Helium
2. Hydrogen



Column	Rt®-Msieve 5A, 30 m, 0.53 mm ID, 50 µm (cat.# 19723)
Sample	Helium/hydrogen gas mixture
Injection	
Inj. Vol.:	25 µL split (split ratio 10:1)
Liner:	2 mm split Precision® liner w/wool (cat.# 20823)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	40 mL/min
Oven	
Oven Temp:	30 °C
Carrier Gas	N_2, constant pressure (7.0 psi, 48.3 kPa)
Linear Velocity:	38 cm/sec @ 30 °C
Detector	TCD @ 200 °C
Make-up Gas Type:	N_2
Data Rate:	20 Hz
Sensitivity Mode:	N_2/Ar
Instrument	HP5890 GC

Permanent Gases on MXT®-Msieve 5A

NEW!

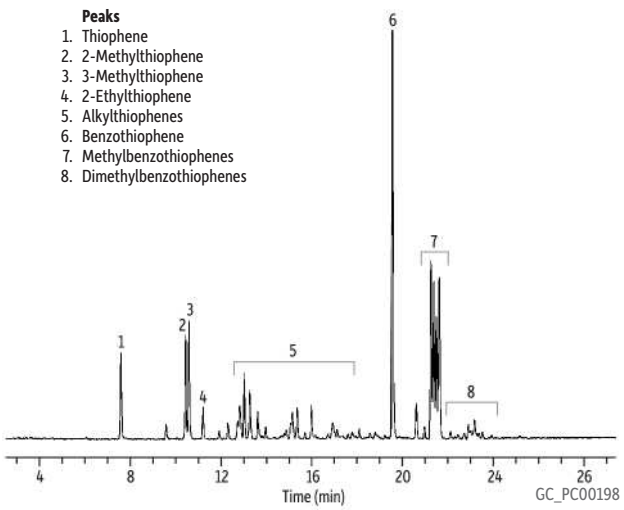


Peaks
1. Helium
2. Argon
3. Oxygen
4. Nitrogen
5. Methane
6. Carbon monoxide

Column	MXT®-Msieve 5A, 30 m, 0.53 mm ID, 50 µm (cat.# 79723)
Sample	
Conc.:	1% in hydrogen
Injection	split (split ratio 50:1)
Oven	
Oven Temp.:	30 °C
Carrier Gas	H_2
Detector	µ-TCD

Sulfur in Gasoline on Rtx®-1

Peaks
1. Thiophene
2. 2-Methylthiophene
3. 3-Methylthiophene
4. 2-Ethylthiophene
5. Alkylthiophenes
6. Benzothiophene
7. Methylbenzothiophenes
8. Dimethylbenzothiophenes

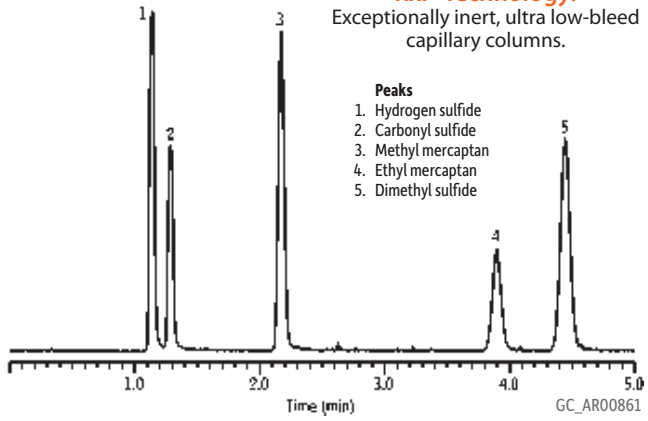


Column	Rtx®-1, 30 m, 0.32 mm ID, 4.0 µm (cat.# 10198)
Sample	Gasoline containing 300 ppm total sulfur
Injection	
Inj. Vol.:	1 µL split (split ratio 10:1)
Inj. Temp.:	275 °C
Oven	
Oven Temp:	40 °C (hold 3 min) to 275 °C at 10 °C/min (hold 5 min)
Carrier Gas	He, constant flow
Flow Rate:	2.5 mL/min
Linear Velocity:	70 cm/sec
Detector	SCD @ 275 °C

Sulfur Compounds on Rxi®-1ms

Rxi® Technology!
Exceptionally inert, ultra low-bleed capillary columns.

Peaks
1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide



Column	Rxi®-1ms, 30 m, 0.32 mm ID, 4.00 µm (cat.# 13396)
Sample	Hydrogen sulfide, carbonyl sulfide, methyl mercaptan, ethyl mercaptan, dimethyl sulfide
Diluent:	helium
Conc.:	100 ppbv
Injection	Splitless
Inj. Temp.:	30 °C
Oven	
Oven Temp:	30 °C
Carrier Gas	He, constant pressure
Linear Velocity:	48 cm/sec @ 30 °C
Detector	SCD @ 800 °C
Notes	Injection: sample loop (30 °C), 1 mL splitless direct
	Sample storage & transfer: SilcoCan® air monitoring canister with Siltek®-treated 1/4" valve (cat.# 24182-650); Sulfinert®-treated gas sample loop, 1 cc (cat.# 22848); Sulfinert®-treated gas sample loop, 10 cc (custom order)

Residual Solvents (Class 1) for Water-Soluble Articles on Rxi®-624Sil MS

Peaks	t_R (min)	Conc. (µg/mL)
1. 1,1-Dichloroethene	3.586	0.07
2. 1,1,1-Trichloroethane	8.536	0.08
3. Carbon tetrachloride	9.042	0.03
4. Benzene	9.787	0.02
5. 1,2-Dichloroethane	10.112	0.04

* DMSO interference

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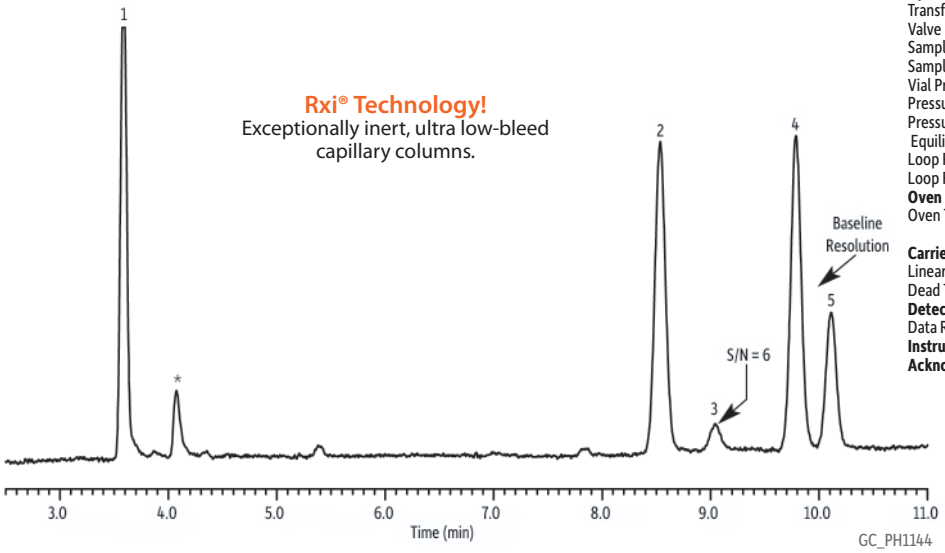
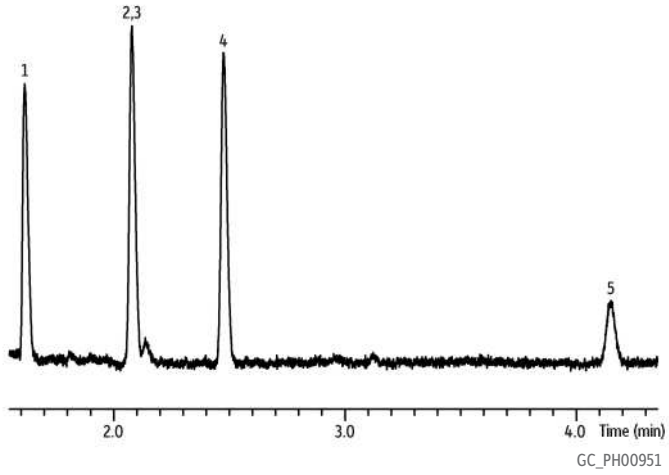
Exceptionally inert, ultra low-bleed capillary columns.



Column	Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870)
Sample	Residual solvents - class 1 (cat.# 36279)
Diluent:	Water
Injection	Headspace-loop split (split ratio 5:1)
Liner:	1 mm split (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	140 °C
Instrument:	Tekmar HT3
Inj. Time:	1 min
Transfer Line Temp.:	110 °C
Valve Oven Temp.:	110 °C
Sample Temp.:	80 °C
Sample Equil. Time:	60 min
Vial Pressure:	10 psi
Pressurize Time:	0.5 min
Pressure Equilibration Time:	0.05 min
Loop Pressure:	5 psi
Loop Fill Time:	0.1 min
Oven	
Oven Temp:	40 °C (hold 20 min) to 240 °C at 10 °C/min (hold 20 min)
Carrier Gas	He, constant flow
Linear Velocity:	35 cm/sec
Dead Time:	1.45 min @ 40 °C
Detector	FID @ 250 °C
Data Rate:	5 Hz
Instrument	Agilent/HP6890 GC
Acknowledgement	Teledyne Tekmar

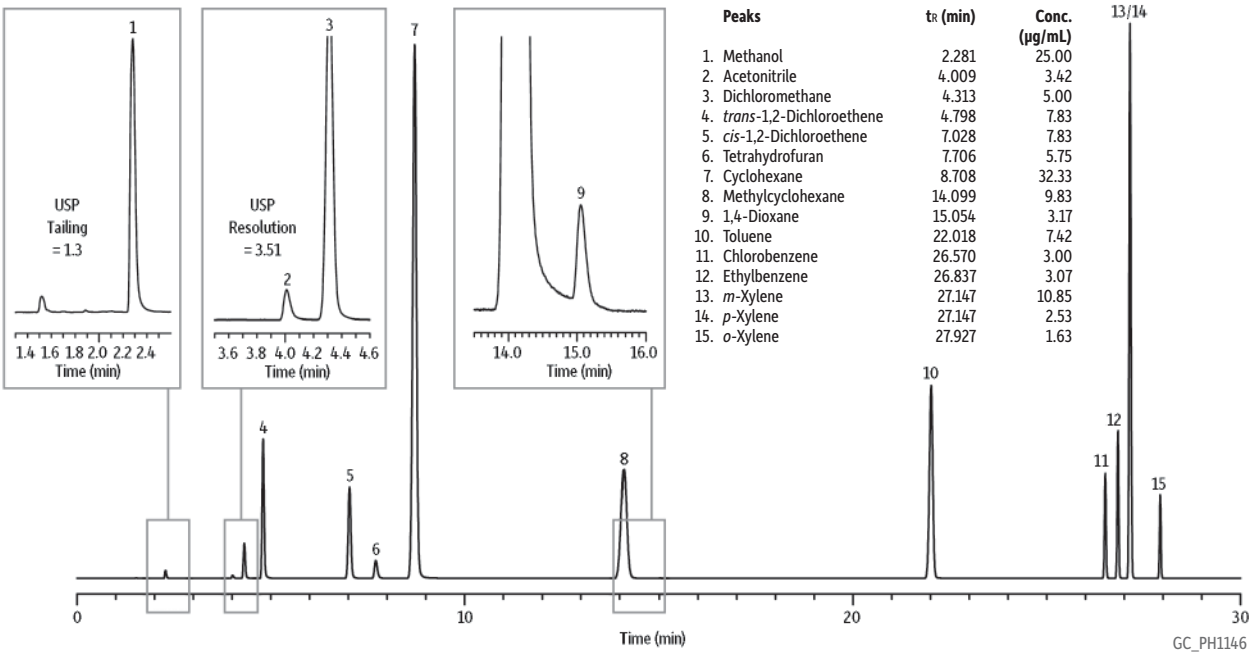
Residual Solvents (Class 1) on Stabilwax® (G16)



Peaks
1. 1,1-Dichloroethene
2. 1,1,1-Trichloroethane
3. Carbon tetrachloride
4. Benzene
5. 1,2-Dichloroethane

Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Residual solvents - class 1 (cat.# 36279) in 20 mL headspace vial (cat.# 24685)
Diluent:	Water
Injection	
Inj. Vol.:	1.0 µL headspace-syringe split (split ratio 5:1)
Liner:	2 mm splitless (cat.# 20712)
Inj. Temp.:	140 °C
Headspace-Syringe	
Instrument:	Overbrook Scientific HT200H
Syringe Temp.:	100 °C
Sample Temp.:	80 °C
Sample Equil. Time:	45 min
Inj. Speed:	8
Inj. Dwell:	5 sec
Oven	
Oven Temp:	50 °C (hold 20 min) to 165 °C at 6 °C/min (hold 20 min)
Carrier Gas	He, constant flow
Flow Rate:	2.15 mL/min
Linear Velocity:	35.2 cm/sec
Detector	FID @ 250 °C

Residual Solvents (Class 2 - Mixture A) for Water-Soluble Articles on Rxi®-624Sil MS



Peaks	t_R (min)	Conc. (µg/mL)
1. Methanol	2.281	25.00
2. Acetonitrile	4.009	3.42
3. Dichloromethane	4.313	5.00
4. *trans*-1,2-Dichloroethene	4.798	7.83
5. *cis*-1,2-Dichloroethene	7.028	7.83
6. Tetrahydrofuran	7.706	5.75
7. Cyclohexane	8.708	32.33
8. Methylcyclohexane	14.099	9.83
9. 1,4-Dioxane	15.054	3.17
10. Toluene	22.018	7.42
11. Chlorobenzene	26.570	3.00
12. Ethylbenzene	26.837	3.07
13. *m*-Xylene	27.147	10.85
14. *p*-Xylene	27.147	2.53
15. *o*-Xylene	27.927	1.63

Column Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870)
Sample Residual solvents class 2 - mix A (cat.# 36271)
Diluent: Water
Injection Headspace-loop split (split ratio 5:1)
Liner: 1 mm split (cat.# 20972)
Headspace-Loop
Inj. Port Temp.: 140 °C
Instrument: Tekmar HT3
Inj. Time: 1 min.
Transfer Line Temp.: 110 °C
Valve Oven Temp.: 110 °C
Sample Temp.: 80 °C
Sample Equil. Time: 60 min
Vial Pressure: 10 psi
Pressurize Time: 0.5 min
Pressure Equilibration Time: 0.05 min
Loop Pressure: 5 psi
Loop Fill Time: 0.1 min

Oven
Oven Temp: 40 °C (hold 20 min) to 240 °C at 10 °C/min (hold 20 min)
Carrier Gas He, constant flow
Linear Velocity: 35 cm/sec
Dead Time: 1.45 min @ 40 °C
Detector FID @ 250 °C
Data Rate: 5 Hz
Instrument Agilent/HP6890 GC
Acknowledgement Teledyne Tekmar

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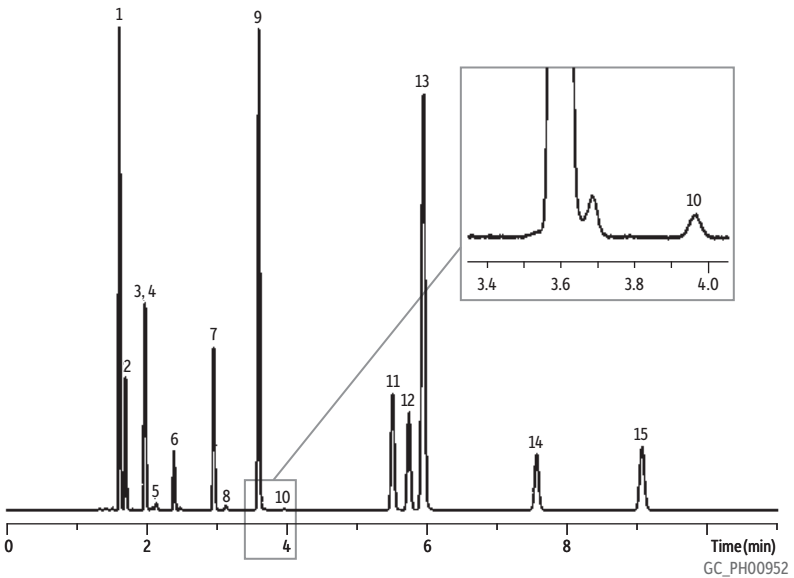
Exceptionally inert, ultra low-bleed capillary columns.

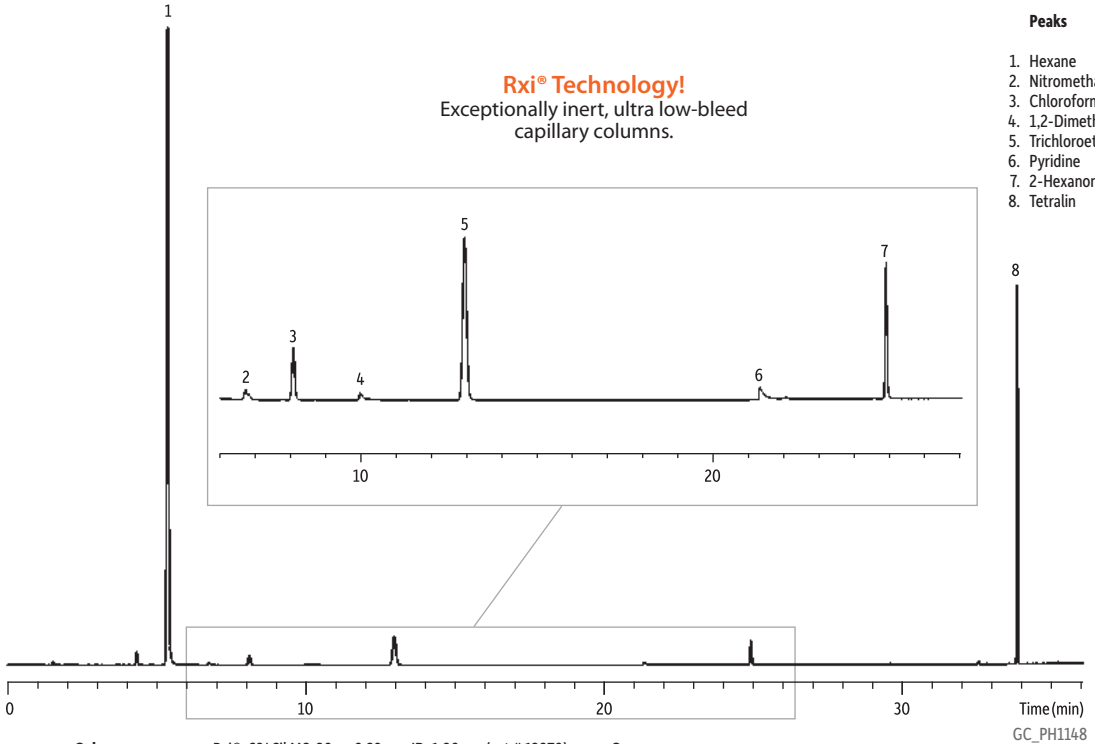
Residual Solvents (Class 2 - Mixture A) on Stabilwax® (G16)



Peaks
1. Cyclohexane
2. Methylcyclohexane
3. *trans*-1,2-Dichloroethene
4. Tetrahydrofuran
5. Methanol
6. Dichloromethane
7. *cis*-1,2-Dichloroethene
8. Acetonitrile
9. Toluene
10. 1,4-Dioxane
11. Ethyl benzene
12. *p*-Xylene
13. *m*-Xylene
14. *o*-Xylene
15. Chlorobenzene

Column Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample Residual solvents class 2 - mix A (cat.# 36271) in 20 mL headspace vial (cat.# 24685)
Diluent: Water
Injection
Inj. Vol.: 1,000 µL headspace-syringe split (split ratio 5:1)
Liner: 2 mm splitless (cat.# 20712)
Inj. Temp.: 140 °C
Headspace-Syringe
Instrument: Overbrook Scientific HT200H
Syringe Temp.: 100 °C
Sample Temp.: 80 °C
Sample Equil. Time: 45 min
Inj. Speed: 8
Inj. Dwell: 5 sec
Oven
Oven Temp: 50 °C (hold 20 min) to 165 °C at 6 °C/min (hold 20 min)
Carrier Gas He, constant flow
Flow Rate: 2.15 mL/min
Linear Velocity: 35.2 cm/sec
Detector FID @ 250 °C

Residual Solvents (Class 2 - Mixture B) for Water-Soluble Articles on Rxi®-624Sil MS



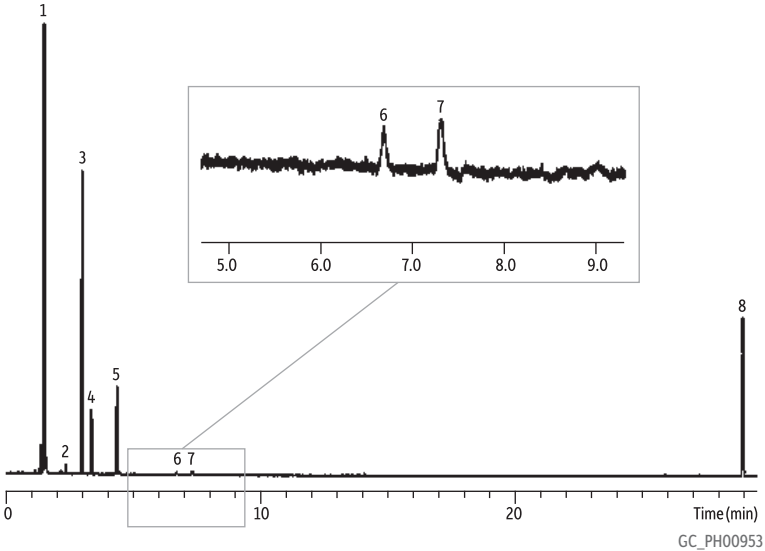
GC_PH1148

Peaks	t_R (min)	Conc. (µg/mL)
1. Hexane	5.355	2.42
2. Nitromethane	6.793	0.42
3. Chloroform	8.092	0.50
4. 1,2-Dimethoxyethane	9.980	0.83
5. Trichloroethene	12.941	0.67
6. Pyridine	21.303	1.67
7. 2-Hexanone	24.862	0.42
8. Tetralin	33.781	0.83

Column	Rxi®-624Sil MS, 30 m, 0.32 mm ID, 1.80 µm (cat.# 13870)
Sample	Residual solvents class 2 - mix B (cat.# 36280)
Diluent:	Water
Injection	Headspace-loop split (split ratio 5:1)
Liner:	1 mm split (cat.# 20972)
Headspace-Loop	
Inj. Port Temp.:	140 °C
Instrument:	Tekmar HT3
Inj. Time:	1 min
Transfer Line Temp.:	110 °C
Valve Oven Temp.:	110 °C
Sample Temp.:	80 °C
Sample Equil. Time:	60 min
Vial Pressure:	10 psi
Pressurize Time:	0.5 min
Pressure Equilibration Time:	0.05 min
Loop Pressure:	5 psi
Loop Fill Time:	0.1 min

Oven	
Oven Temp:	40 °C (hold 20 min) to 240 °C at 10 °C/min (hold 20 min)
Carrier Gas	He, constant flow
Linear Velocity:	35 cm/sec
Dead Time:	1.45 min @ 40 °C
Detector	FID @ 250 °C
Data Rate:	5 Hz
Instrument	Agilent/HP6890 GC
Acknowledgement	Teledyne Tekmar

Residual Solvents (Class 2 - Mixture B) on Stabilwax® (G16)



GC_PH00953

Peaks
1. Hexane
2. 1,2-Dimethoxyethane
3. Trichloroethylene
4. Chloroform
5. 2-Hexanone
6. Nitromethane
7. Pyridine
8. Tetralin

Column	Stabilwax®, 30 m, 0.32 mm ID, 0.25 µm (cat.# 10624)
Sample	Residual solvents class 2 - mix B (cat.# 36272) in 20 mL headspace vial (cat.# 24685)
Diluent:	Water
Injection	
Inj. Vol.:	1,000 µL headspace-syringe split (split ratio 5:1)
Liner:	2 mm splitless (cat.# 20712)
Inj. Temp.:	140 °C
Headspace-Syringe	
Instrument:	Overbrook Scientific HT200H
Syringe Temp.:	100 °C
Sample Temp.:	80 °C
Sample Equil. Time:	45 min
Inj. Speed:	8
Inj. Dwell:	5 sec
Oven	
Oven Temp:	50 °C (hold 20 min) to 165 °C at 6 °C/min (hold 20 min)
Carrier Gas	He, constant flow
Flow Rate:	2.15 mL/min
Linear Velocity:	35.2 cm/sec
Detector	FID @ 250 °C

Organic Volatile Impurities: Retention Time Index

Reduce method development time—use a retention time index for column selection.

Rxi®-624Sil MS
20 m x 0.18 mm x 1.0 µm df
Dead time 0.81 minutes constant flow
Initial 45 °C (hold 5 min) 7 °C/min to 220 °C (hold 5 min)

for more info

See pages 680–682 for Rxi®-624Sil MS chromatograms.

Compound	MS ion	char.ion	45(5)7/220(5)
Formaldehyde	29	30,31	1.16
Methanol	31	29,30,33	1.36
Pentane	43	41,42,72,57,29	1.74
Ethanol	31	45,46,27	1.76
Diethylether	59	74,45	1.87
2-Chloropropane	43	73,63,80,27	1.95
Acetone	43	58,27,39	2.06
Methylal	45	75,29,31	2.07
1,1-Dichloroethene	61	96,61,63	2.08
2-Propanol	45	43,27,59	2.15
Ethyl formate	45	31,29,27,74	2.2
Methyl acetate	43	74,59,29	2.33
Acetonitrile	41	40,39,38	2.33
2-Methylpentane	43	42,41,71,86	2.48
Methylene chloride	84	49,86,51,88	2.5
Methyl *tert*-buyl ether	73	57,41,43,45	2.7
trans-1,2-Dichloroethene	61	96,98,63	2.76
Hexane	57	41,86,43	3.05
Isopropyl ether	45	43,87,69	3.22
1-Propanol	31	42,59,27	3.22
Methyl cyclopentane	56	41,69,84	3.76
Nitromethane	61	46,30	3.83
2-Butanone (MEK)	72	43,57 (use 43)	3.9
cis-1,2-Dichloroethene	96	96,61,98	3.96
Ethyl acetate	43	61,70	4
2-Butanol	45	59,31	4.21
Tetrahydrofuran	42	72,71,41 (use 72)	4.34
Chloroform	83	83,85,47,87,118	4.51
1,1,1-Trichloroethane	97	97,99,61	4.76
2,2-Dimethoxypropane	73	89,43,42,31	4.81
Cyclohexane	56	84,41,27	4.88
Carbon tetrachloride	117	117,119	5.04
Isobutyl alcohol	42	43,31,41,33	5.31
2-Methoxyethanol	45	47,76	5.31
1,2-Dimethoxyethane	45	60,58,90	5.41
Benzene	78	78	5.41

Compound	MS ion	char.ion	45(5)7/220(5)
1,2-Dichloroethane	62	62,98	5.55
Isopropyl acetate	43	61,87	5.59
Isooctane	57	56,41	5.63
Methyl isopropyl ketone	43	41,86	6
n-Heptane (C7)	43	57,71,100	6.06
1-Butanol	56	41,43,55	6.67
Trichloroethene	95	95,97,134,132	6.73
Methyl cyclohexane	83	55,98	7.17
1,4-Dioxane	88	58,43,57	7.43
Propyl acetate	43	61,73	7.61
2-Ethoxyethanol	59	31,45,72	8.12
Pyridine	79	52,50,51	9.04
Hexanone (MIBK)	43	58,56,85,100	9.17
Isoamyl alcohol	55	42,41,43,70	9.33
Toluene	91	92,65,51	9.37
Ethylene glycol	31	33	9.69
Isobutyl acetate	43	56,73	9.91
1-Pentanol	42	55,70,41	10.43
Formamide	45	29,44	10.49
1,1-Diethoxypropane	59	47,87,103	10.79
2-Hexanone (MBK)	43	58,57,100	10.88
Butyl acetate	43	56	11.31
Dimethyl formamide (DMF)	73	44,58	11.68
Chlorobenzene	112	112,77,114	12.35
Ethylbenzene	91	91,106	12.64
p-Xylene	106	106,91	12.93
m-Xylene	106	106,91	12.93
Isoamyl acetate	43	55,70	13.28
o-Xylene	106	106,91	13.74
Dimethyl sulfoxide	78	63,45	14.06
N,N-Dimethylacetamide	87	44,43,72	14.45
Isopropylbenzene (cumene)	105	120,77	14.55
Anisole	108	78,65,51	14.72
1-Methyl-2-pyrrolidinone	99	98,44,42	19.54
1,2,3,4-Tetrahydronaphthalene	104	132,117,91,65	21.39
Sulfolane	41	56,55,120	24.77

free literature

Rxi®-624Sil MS: The "Go To" GC Column for Fast, Effective Volatile Impurities Method Development

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Organic Volatile Impurities: Retention Time Index

Reduce method development time—use a retention time index for column selection.

Retention time data collected using the following conditions:

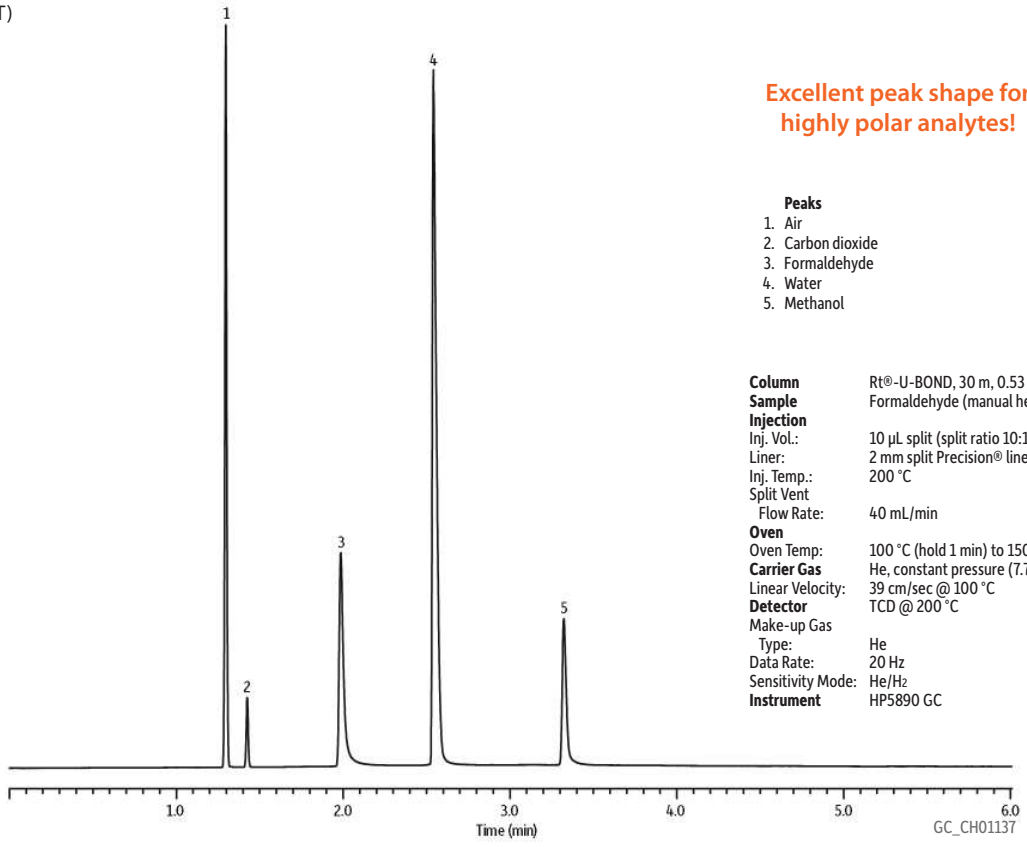
G16 Stabilwax®: 30 m, 0.25 mm ID, 0.5 µm df, Phase ratio: 125, Oven program: 40 °C, hold 1 min, to 190 °C @ 4 °C/min, hold 15 min, Carrier flow: 1.2 mL/min, Dead time: 1.38 min @ 45 °C
G16 Rtx®-WAX: 30 m, 0.25 mm ID, 0.5 µm df, Phase ratio: 125, Oven program: 40 °C, hold 1 min, to 190 °C @ 4 °C/min, hold 15 min, Carrier flow: 1.2 mL/min, Dead time: 1.40 min @ 45 °C
G43 Rtx®-1301: 30 m, 0.25 mm ID, 1.0 µm df, Phase ratio: 63, Oven program: 40 °C, hold 1 min, to 190 °C @ 4 °C/min, hold 15 min, Carrier flow: 1.2 mL/min, Dead time: 1.40 min @ 45 °C
G27 Rxi®-5ms: 30 m, 0.25 mm ID, 1.0 µm df, Phase ratio: 63, Oven program: 40 °C, hold 1 min, to 190 °C @ 4 °C/min, hold 15 min, Carrier flow: 1.1 mL/min, Dead time: 1.49 min @ 45 °C
G1 Rtx®-1: 60 m, 0.53 mm ID, 3.00 µm df, Phase ratio: 43, Oven program: 30 °C, hold 4 min, to 220 °C @ 4 °C/min, Carrier flow: 6.3 mL/min, Dead time: 2.54 min @ 35 °C
Rtx®-200: 60 m, 0.53 mm ID, 3.00 µm df, Phase ratio: 43, Oven program: 30 °C, hold 4 min, to 220 °C @ 4 °C/min, Carrier flow: 7.8 mL/min, Dead time: 2.22 min @ 35 °C

Carrier gas: helium	ICH	G16 Stabilwax®	G16 Rtx®-WAX	G43 Rtx®-1301	G27 Rxi®-5ms	G1 Rtx®-1	NA Rtx®-200
Compound	**Class**	**Retention Time**	**Retention Time**	**Retention Time**	**Retention Time**	**Retention Time**	**Retention Time**
1,1,1-Trichloroethane	1	3.96	3.49	5.43	5.40	10.82	8.35
1,1,2-Trichloroethene	2	15.72	14.28	10.99	9.77	16.75	14.94
1,1-Dichloroethene	1	2.23	2.04	2.79	4.41	5.73	4.16
1,2-Dichloroethane	1	8.80	7.68	6.15	5.46	10.38	9.74
cis-1,2-Dichloroethene	2	6.50	5.65	4.79	2.88	8.71	7.11
trans-1,2-Dichloroethene	2	3.63	3.20	3.55	3.54	7.17	5.16
1,2-Dimethoxyethane	2	4.80	4.18	6.03	5.54	10.98	10.63
1,4-Dioxane	2	8.55	7.49	7.86	7.26	13.54	14.34
1-Butanol	3	11.13	10.08	7.18	5.76	11.49	10.13
1-Pentanol	3	14.95	13.75	11.19	9.44	16.99	14.95
1-Propanol	3	7.69	6.80	4.20	3.37	6.81	6.13
2-Butanol	3	7.25	6.44	5.08	4.16	8.51	7.69
2-Ethoxyethanol	2	13.99	12.70	8.69	7.36	13.91	13.99
2-Methoxyethanol	2	12.42	11.11	6.02	5.14	9.83	10.74
2-Methyl-1-propanol	3	9.32	8.40	6.00	4.79	*	*
2-Propanol	3	4.81	4.25	3.00	2.55	4.91	4.69
3-Methyl-1-butanol	3	13.42	12.25	9.86	8.26	15.28	13.55
Acetic acid	3	22.47	20.34	6.52	4.61	8.84	8.96
Acetone	3	3.02	2.64	2.89	2.50	4.64	7.68
Acetonitrile	2	6.91	5.83	3.28	2.47	4.32	8.89
Anisole	3	18.65	17.09	17.12	16.28	25.00	22.84
Benzene	1	5.23	4.54	5.98	3.83	11.63	9.17
Butyl acetate	3	8.86	7.88	12.12	11.38	19.43	19.63
Carbon tetrachloride	1	3.96	3.49	5.61	5.90	11.89	7.42
Chlorobenzene	2	13.91	12.54	13.55	13.14	21.56	18.48
Chloroform	2	7.31	6.41	5.23	4.64	9.18	6.66
Cumene	3	12.36	11.17	16.66	16.69	25.88	20.90
Cyclohexane	2	2.16	2.01	5.37	5.89	*	*
Dichloromethane	2	5.01	4.33	3.31	3.06	5.87	4.88
Dimethylsulfoxide	3	26.47	24.43	16.62	13.01	18.81	30.95
Ethanol	3	4.98	4.37	2.52	2.19	4.03	3.80
Ethyl acetate	3	4.08	3.56	4.87	4.44	9.04	10.35
Ethyl benzene	2	10.72	9.58	13.86	13.81	22.54	18.18
Ethyl ether	3	1.72	1.63	2.58	2.67	5.34	3.87
Ethyl formate	3	3.16	2.78	3.00	2.78	5.46	6.48
Ethylene glycol	2	28.06	26.23	10.77	6.63	12.59	13.86
Formamide	2	32.99	30.93	11.85	7.30	12.72	19.93
Formic acid	3	24.64	22.09	5.19	2.60	5.59	5.06
Heptane	3	1.98	1.86	6.34	6.98	14.18	7.84
Hexane	2	1.65	1.58	3.77	4.11	9.06	4.86
Isobutyl acetate	3	6.99	6.18	10.39	9.69	17.35	18.02
Isopropyl acetate	3	4.26	3.74	6.19	5.71	11.47	12.38
Methanol	2	4.23	3.64	1.96	1.80	3.14	2.93
Methyl acetate	3	3.19	2.80	3.17	2.93	5.80	7.10
Methylbutyl ketone	2	9.10	8.05	11.81	10.50	17.94	20.81
Methylcyclohexane	2	2.50	2.30	7.31	7.95	15.49	9.21
Methylethyl ketone	3	4.33	3.76	4.90	4.09	7.99	11.55
Methylisobutyl ketone	3	6.84	5.97	9.64	8.49	15.35	18.41
m-Xylene	2	11.21	10.04	14.29	14.17	23.01	18.78
N,N-Dimethylacetamide	2	20.75	19.01	12.95	13.96	21.42	30.00
N,N-Dimethylformamide	2	18.04	16.26	13.09	10.23	16.52	26.19
Nitromethane	2	11.82	10.31	4.84	3.53	6.30	12.01
N-Methylpyrrolidone	2	29.84	27.86	25.09	21.85	29.99	38.08
o-Xylene	2	12.79	11.51	15.46	15.26	24.23	20.33
Pentane	3	1.49	1.45	2.39	2.62	5.36	3.29
Propyl acetate	3	5.98	5.29	8.03	7.44	*	*
p-Xylene	2	10.98	9.82	14.29	14.17	22.99	18.69
Pyridine	2	12.64	11.24	9.60	8.57	15.40	16.45
Sulfolane	2	47.62	43.31	34.02	28.90	36.76	48.67
tert-Butylmethyl ether	3	1.94	1.82	3.50	3.59	7.52	5.73
Tetrahydrofuran	3	3.63	3.19	5.12	4.90	9.81	9.48
Tetralin	2	25.12	23.48	27.49	27.44	37.27	31.72
Toluene	2	7.86	6.91	9.80	9.66	17.36	14.00
1,1-Diethoxypropane	—	5.42	4.84	11.39	11.38	19.82	15.08
2,2-Dimethoxypropane	—	3.11	2.79	5.48	5.55	11.37	8.67
2-Chloropropane	—	1.96	1.82	2.67	2.66	5.20	4.61
2-Methylpentane	—	1.58	1.52	3.22	3.56	7.72	4.32
Acetaldehyde	—	2.05	1.85	1.86	1.84	3.14	3.90
Chloroethane	—	1.83	1.71	2.14	2.10	3.97	3.55
Chloromethane	—	1.63	1.55	1.70	1.70	3.01	2.73
Ethylene oxide	—	2.05	1.86	1.89	2.02	3.59	3.92
Formaldehyde	—	2.25	1.57	1.68	1.58	2.66	2.59
Isoamyl acetate	—	10.51	9.43	14.84	14.18	22.80	22.62
Isooctane	—	1.85	1.75	5.84	6.59	13.66	8.07
Isopropyl ether	—	1.86	1.76	4.03	4.23	9.03	5.83
Methyl cyclopentane	—	1.91	1.79	4.50	4.93	10.41	5.81
Methyl isopropyl ketone	—	4.93	4.29	6.58	5.69	11.04	14.47
Methylal	—	2.26	2.06	2.84	2.82	5.65	5.09
Trichloroethene	—	6.50	5.70	7.07	7.05	13.58	9.75
Water	—	8.24	7.18	1.74	1.68	2.75	2.57

* Not determined

Formaldehyde on Rt®-U-BOND

(PLOT)

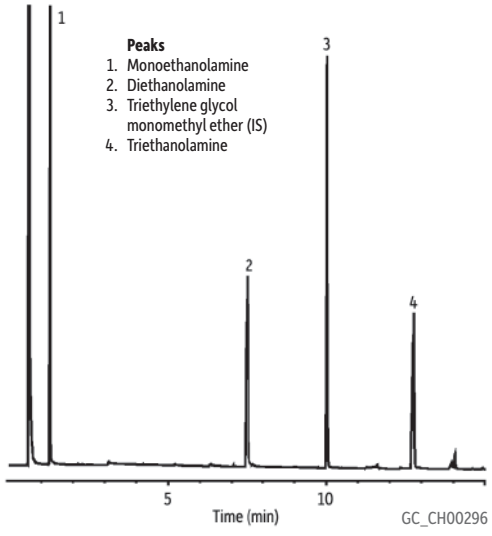


Excellent peak shape for highly polar analytes!

Peaks
1. Air
2. Carbon dioxide
3. Formaldehyde
4. Water
5. Methanol

Column	Rt®-U-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19750)
Sample	Formaldehyde (manual headspace)
Injection	
Inj. Vol.:	10 µL split (split ratio 10:1)
Liner:	2 mm split Precision® liner w/wool (cat.# 20823)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	40 mL/min
Oven	
Oven Temp:	100 °C (hold 1 min) to 150 °C at 25 °C/min (hold 3 min)
Carrier Gas	He, constant pressure (7.7 psi, 53.1 kPa)
Linear Velocity:	39 cm/sec @ 100 °C
Detector	TCD @ 200 °C
Make-up Gas Type:	He
Data Rate:	20 Hz
Sensitivity Mode:	He/H_2
Instrument	HP5890 GC

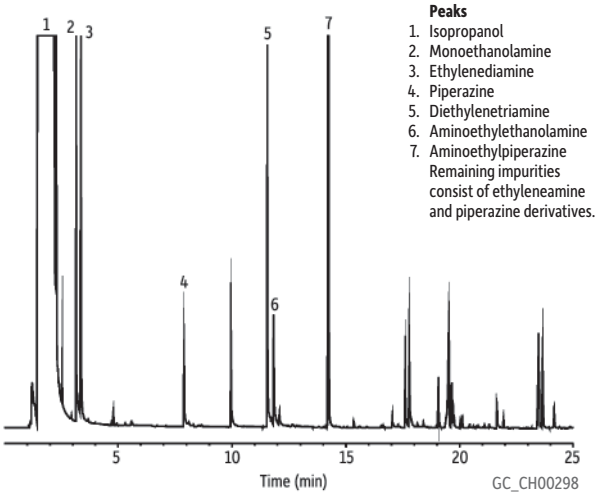
Ethanolamines on Rtx®-5 Amine



Peaks
1. Monoethanolamine
2. Diethanolamine
3. Triethylene glycol monomethyl ether (IS)
4. Triethanolamine

Column	Rtx®-5 Amine, 15 m, 0.25 mm ID, 0.50 µm (cat.# 12335)
Sample	Ethanolamine mix
Diluent:	Methanol
Conc.:	34 ng on column
Injection	
Inj. Vol.:	1.0 µL split (split ratio 58:1)
Inj. Temp.:	280 °C
Oven	
Oven Temp:	50 °C (hold 2 min) to 180 °C at 10 °C/min (hold 2 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	43 cm/sec @ 50 °C
Detector	FID @ 300 °C
Notes	FID sensitivity: 6.4 x 10^{-11} AFS

Ethyleneamines on Rtx®-5 Amine



Peaks
1. Isopropanol
2. Monoethanolamine
3. Ethylenediamine
4. Piperazine
5. Diethylenetriamine
6. Aminoethylethanolamine
7. Aminoethylpiperazine

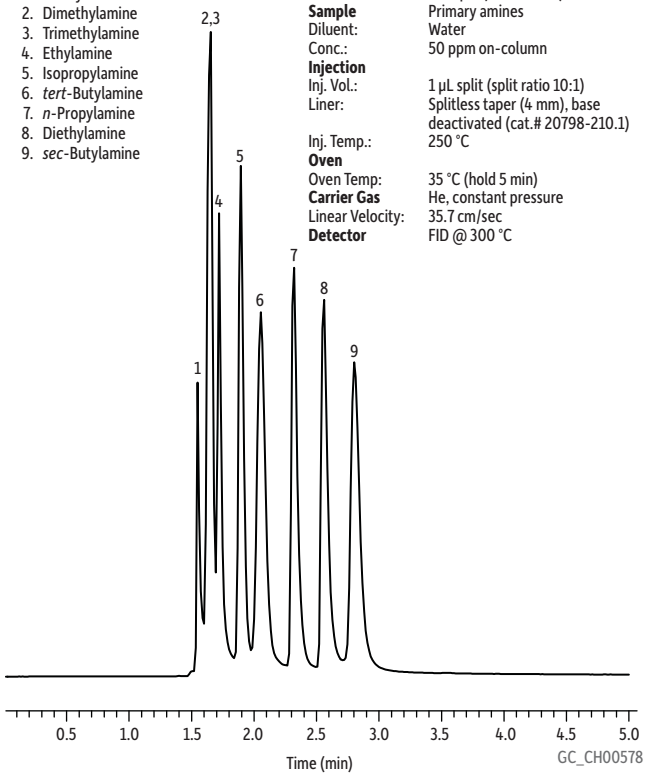
Remaining impurities consist of ethyleneamine and piperazine derivatives.

Column	Rtx®-5 Amine, 30 m, 0.25 mm ID, 0.50 µm (cat.# 12338)
Sample	Ethyleneamine industrial sample
Conc.:	~5-80 ng on-column
Injection	
Inj. Vol.:	3.0 µL split (split ratio 20:1)
Inj. Temp.:	315 °C
Oven	
Oven Temp:	40 °C (hold 4 min) to 315 °C at 10 °C/min (hold 5 min)
Carrier Gas	H_2, constant pressure
Linear Velocity:	43 cm/sec @ 40 °C
Detector	FID @ 315 °C
Notes	FID sensitivity: 6.4 x 10^{-11} AFS

Primary Amines on Rtx®-35 Amine

Peaks
1. Methylamine
2. Dimethylamine
3. Trimethylamine
4. Ethylamine
5. Isopropylamine
6. *tert*-Butylamine
7. *n*-Propylamine
8. Diethylamine
9. *sec*-Butylamine

Column	Rtx®-35 Amine, 30 m, 0.53 mm ID, 1.00 µm (cat.# 11355)
Sample	Primary amines
Diluent:	Water
Conc.:	50 ppm on-column
Injection	
Inj. Vol.:	1 µL split (split ratio 10:1)
Liner:	Splitless taper (4 mm), base deactivated (cat.# 20798-210.1)
Inj. Temp.:	250 °C
Oven	
Oven Temp:	35 °C (hold 5 min)
Carrier Gas	He, constant pressure
Linear Velocity:	35.7 cm/sec
Detector	FID @ 300 °C



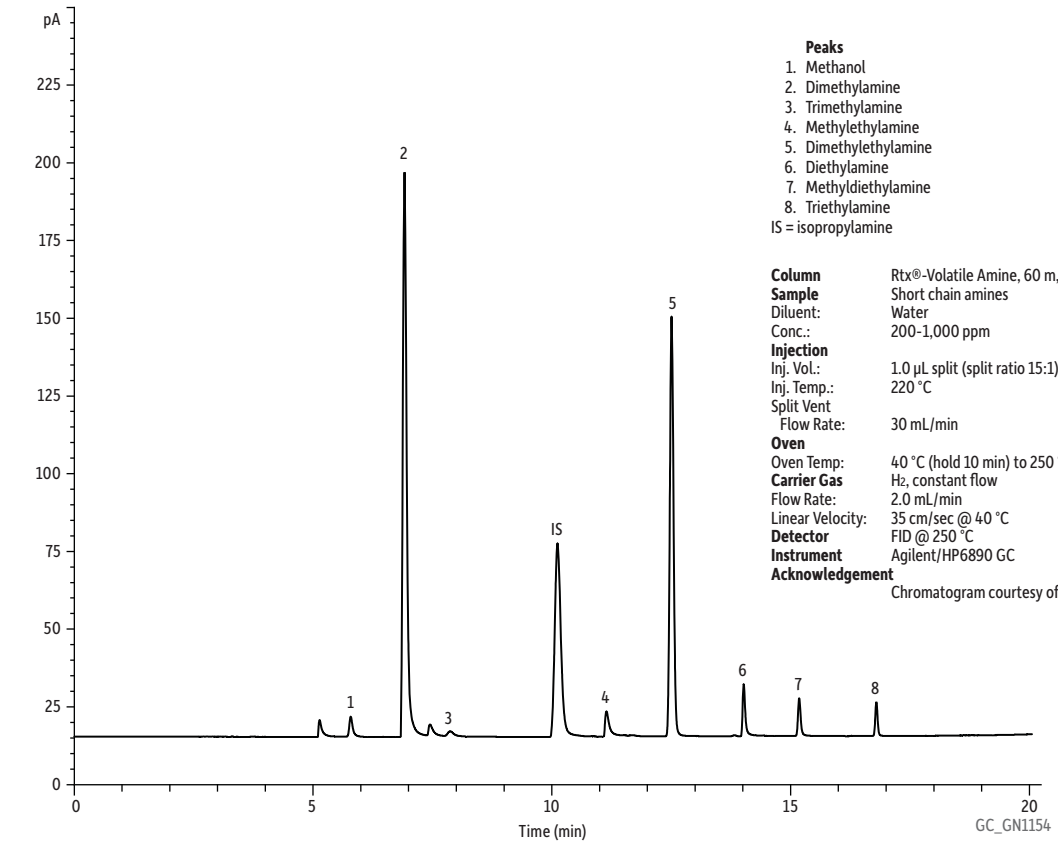
Short Chain Amines in Water on Rtx®-Volatile Amine

NEW!

Peaks
1. Methanol
2. Dimethylamine
3. Trimethylamine
4. Methylethylamine
5. Dimethylethylamine
6. Diethylamine
7. Methyldiethylamine
8. Triethylamine

IS = isopropylamine

Column	Rtx®-Volatile Amine, 60 m, 0.32 mm ID (cat.# 18078)
Sample	Short chain amines
Diluent:	Water
Conc.:	200-1,000 ppm
Injection	
Inj. Vol.:	1.0 µL split (split ratio 15:1)
Inj. Temp.:	220 °C
Split Vent Flow Rate:	30 mL/min
Oven	
Oven Temp:	40 °C (hold 10 min) to 250 °C at 20 °C/min (hold 10 min)
Carrier Gas	H_2, constant flow
Flow Rate:	2.0 mL/min
Linear Velocity:	35 cm/sec @ 40 °C
Detector	FID @ 250 °C
Instrument	Agilent/HP6890 GC
Acknowledgement	Chromatogram courtesy of Mr. Gilbert Baele of Taminco, Belgium

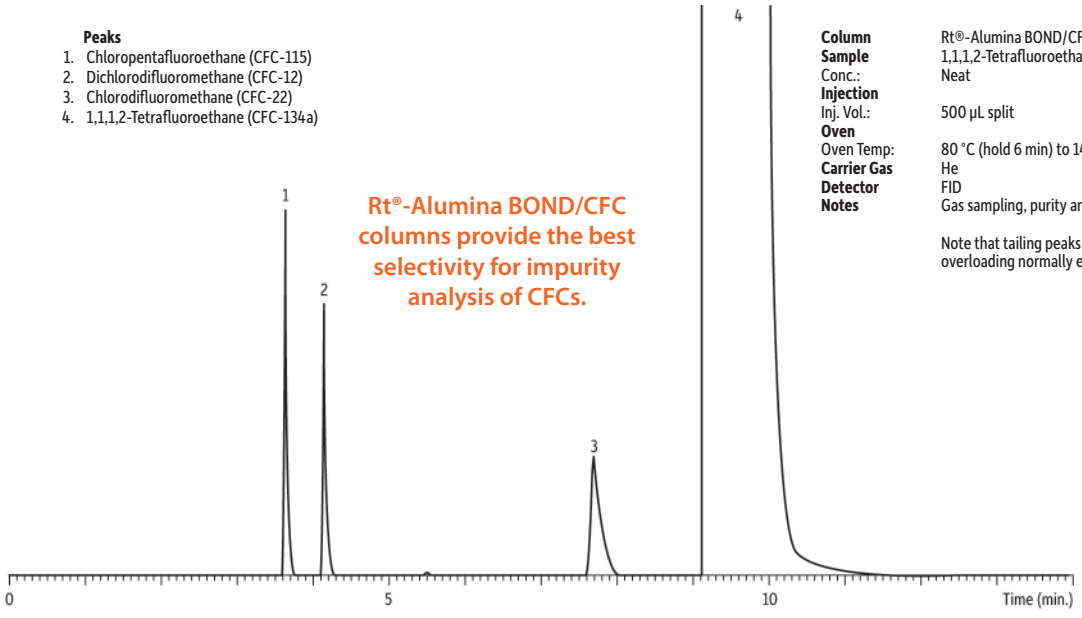


Impurity Analysis of 1,1,1,2-Tetrafluoroethane (CFC-134a) on Rt®-Alumina BOND/CFC

(PLOT)

NEW!

Peaks
1. Chloropentafluoroethane (CFC-115)
2. Dichlorodifluoromethane (CFC-12)
3. Chlorodifluoromethane (CFC-22)
4. 1,1,1,2-Tetrafluoroethane (CFC-134a)



GC_GN1155

Rt®-Alumina BOND/CFC columns provide the best selectivity for impurity analysis of CFCs.

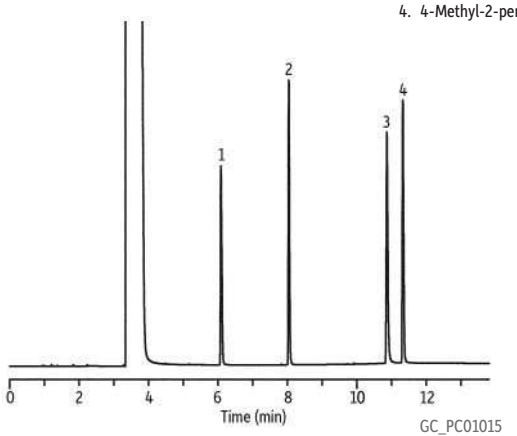
Column	Rt®-Alumina BOND/CFC, 30 m, 0.53 mm ID (cat.# 19763)
Sample	1,1,1,2-Tetrafluoroethane
Conc.:	Neat
Injection	
Inj. Vol.:	500 µL split
Oven	
Oven Temp:	80 °C (hold 6 min) to 140 °C at 10 °C/min (hold 2 min)
Carrier Gas	He
Detector	FID
Notes	Gas sampling, purity analysis

Note that tailing peaks are common in CFC analyses due to overloading normally employed for this type of work.

Ketones on Rt®-QS-BOND

(PLOT)

Peaks
1. Acetone
2. 2-Butanone
3. 2-Hexanone
4. 4-Methyl-2-pentanone

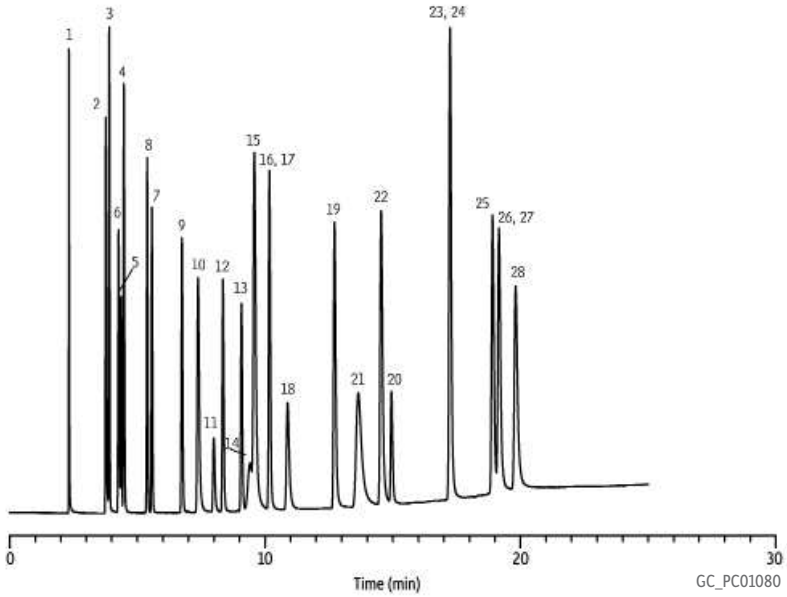


GC_PC01015

Column	Rt®-QS-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19738)
Sample	VOA calibration mix #1 (ketones) (cat.# 30006)
Diluent:	Methanol:water, 90:10 (v/v)
Conc.:	1,000 µg/mL
Injection	
Inj. Vol.:	1 µL split (split ratio 50:1)
Liner:	Siltek® splitless taper (4 mm) (cat.# 20798-214.1)
Inj. Temp.:	240 °C
Oven	
Oven Temp:	60 °C to 225 °C at 15 °C/min (hold 10 min)
Carrier Gas	He, constant flow
Flow Rate:	5.7 mL/min
Detector	FID @ 240 °C

Solvent Mixture on Rt®-S-BOND

(PLOT)



GC_PC01080

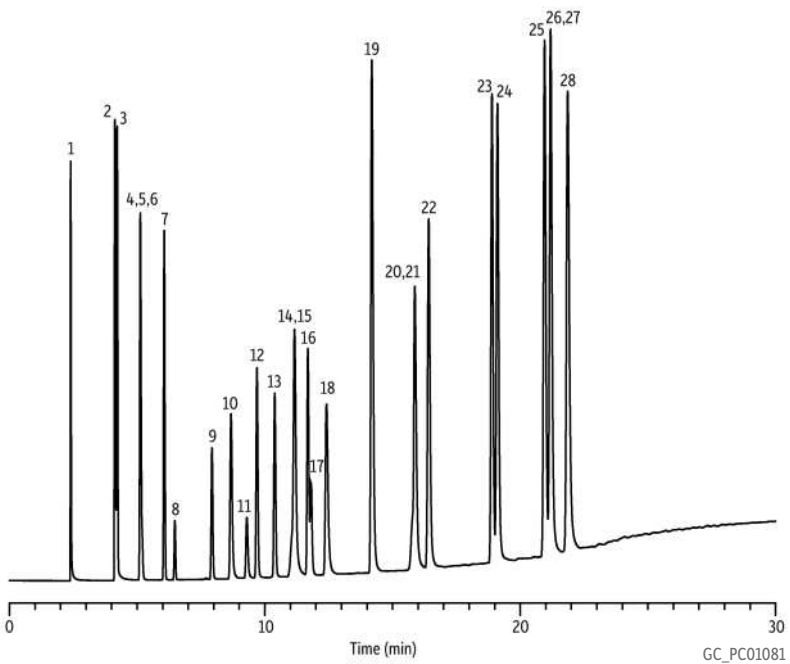
Peaks

1. Methanol
2. Ethanol
3. Acetonitrile
4. Acetone
5. Dichloromethane
6. 1,1-Dichloroethene
7. Nitromethane
8. *trans*-1,2-Dichloroethylene
9. *cis*-1,2-Dichloroethylene
10. Tetrahydrofuran
11. Chloroform
12. Ethyl acetate
13. 1,2-Dichloroethane
14. 1,1,1-Trichloroethane
15. Benzene
16. 1,2-Dimethoxyethane
17. Trichloroethylene
18. 1,4-Dioxane
19. Pyridine
20. Dimethylformamide
21. Methylcyclohexane
22. Toluene
23. 2-Hexanone
24. Chlorobenzene
25. Ethylbenzene
26. *m*-Xylene
27. *p*-Xylene
28. *o*-Xylene

Column	Rt®-S-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19746)
Sample	Solvent mixture
Injection	
Inj. Vol.:	1.0 µL split
Liner:	Taper (4 mm) (cat.# 20798)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp:	120 °C to 220 °C at 5 °C/min (hold 5.0 min)
Carrier Gas	H_2, constant pressure (4.2 psi, 29.0 kPa)
Linear Velocity:	40 cm/sec @ 120 °C
Detector	FID @ 220 °C

Solvent Mixture on Rt®-QS-BOND

(PLOT)



GC_PC01081

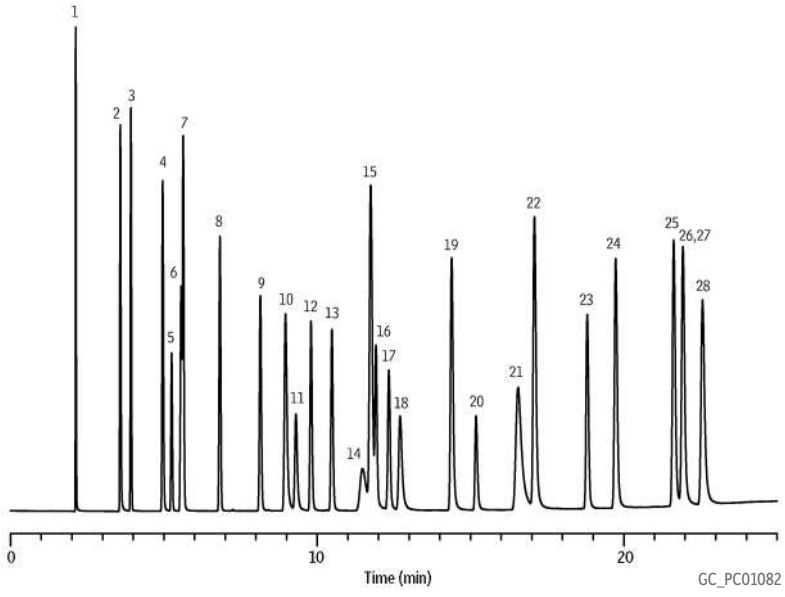
Peaks

1. Methanol
2. Ethanol
3. Acetonitrile
4. Acetone
5. Dichloromethane
6. 1,1-Dichloroethene
7. Nitromethane
8. *trans*-1,2-Dichloroethylene
9. *cis*-1,2-Dichloroethylene
10. Tetrahydrofuran
11. Chloroform
12. Ethyl acetate
13. 1,2-Dichloroethane
14. 1,1,1-Trichloroethane
15. Benzene
16. 1,2-Dimethoxyethane
17. Trichloroethylene
18. 1,4-Dioxane
19. Pyridine
20. Dimethylformamide
21. Methylcyclohexane
22. Toluene
23. 2-Hexanone
24. Chlorobenzene
25. Ethylbenzene
26. *m*-Xylene
27. *p*-Xylene
28. *o*-Xylene

Column	Rt®-QS-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19738)
Sample	Solvent mixture
Injection	
Inj. Vol.:	1.0 µL split
Liner:	Splitless taper (4 mm) (cat.# 20798)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp:	120 °C to 240 °C at 5 °C/min (hold 5.0 min)
Carrier Gas	H_2, constant pressure (4.2 psi, 29.0 kPa)
Linear Velocity:	40 cm/sec @ 120 °C
Detector	FID @ 240 °C

Solvent Mixture on Rt®-Q-BOND

(PLOT)

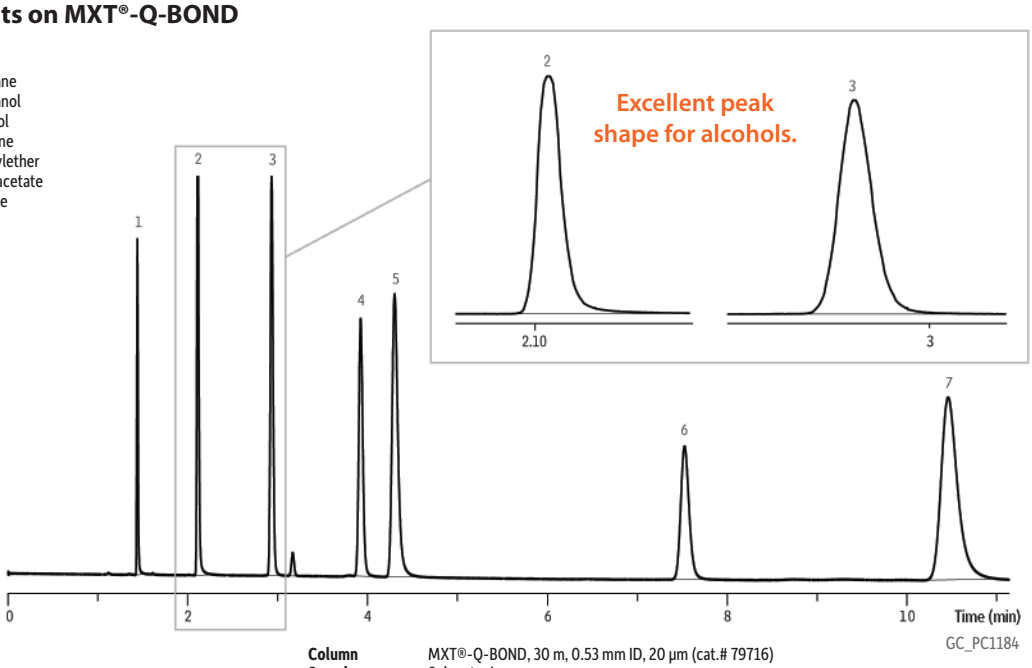


Peaks
1. Methanol
2. Ethanol
3. Acetonitrile
4. Acetone
5. Dichloromethane
6. 1,1-Dichloroethene
7. Nitromethane
8. *trans*-1,2-Dichloroethylene
9. *cis*-1,2-Dichloroethylene
10. Tetrahydrofuran
11. Chloroform
12. Ethyl acetate
13. 1,2-Dichloroethane
14. 1,1,1-Trichloroethane
15. Benzene
16. 1,2-Dimethoxyethane
17. Trichloroethylene
18. 1,4-Dioxane
19. Pyridine
20. Dimethylformamide
21. Methylcyclohexane
22. Toluene
23. 2-Hexanone
24. Chlorobenzene
25. Ethylbenzene
26. *m*-Xylene
27. *p*-Xylene
28. *o*-Xylene

Column	Rt®-Q-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 19742)
Sample	Solvent mixture
Injection	
Inj. Vol.:	1.0 µL split
Liner:	Splitless taper (4 mm) (cat.# 20798)
Inj. Temp.:	200 °C
Split Vent Flow Rate:	100 mL/min
Oven	
Oven Temp:	120 °C to 240 °C at 5 °C/min (hold 5.0 min)
Carrier Gas	H_2, constant pressure (4.2 psi, 29.0 kPa)
Linear Velocity:	40 cm/sec @ 120 °C
Detector	FID @ 240 °C

Solvents on MXT®-Q-BOND

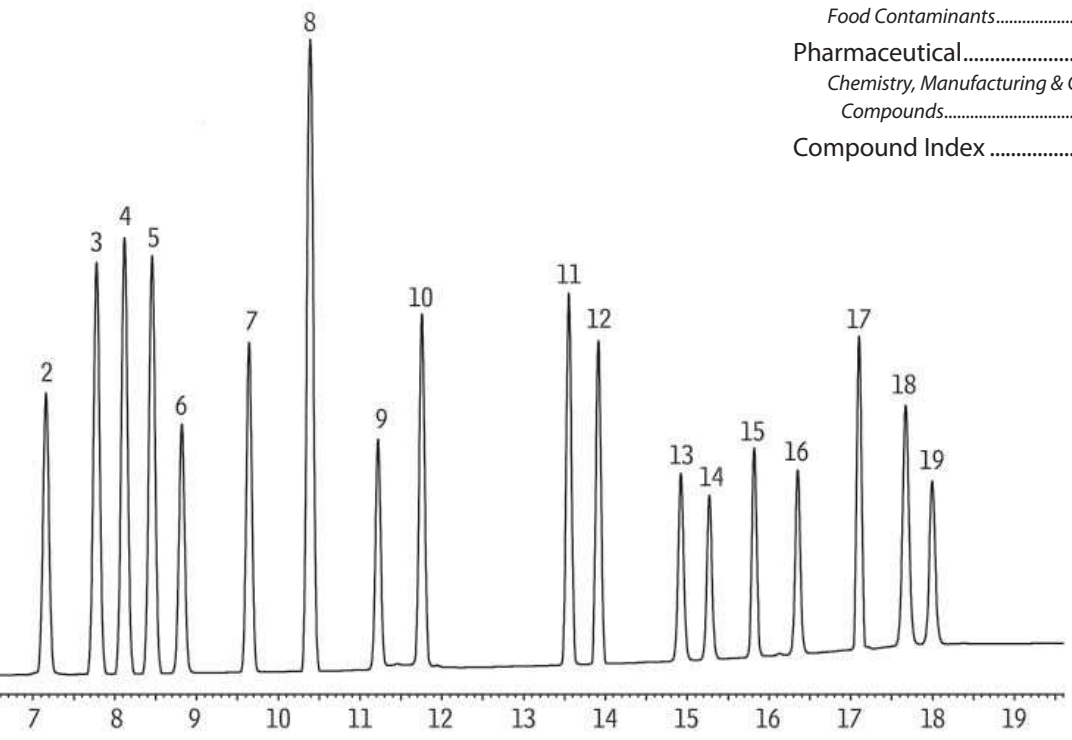
Peaks
1. Methane
2. Methanol
3. Ethanol
4. Acetone
5. Diethylether
6. Ethyl acetate
7. Hexane

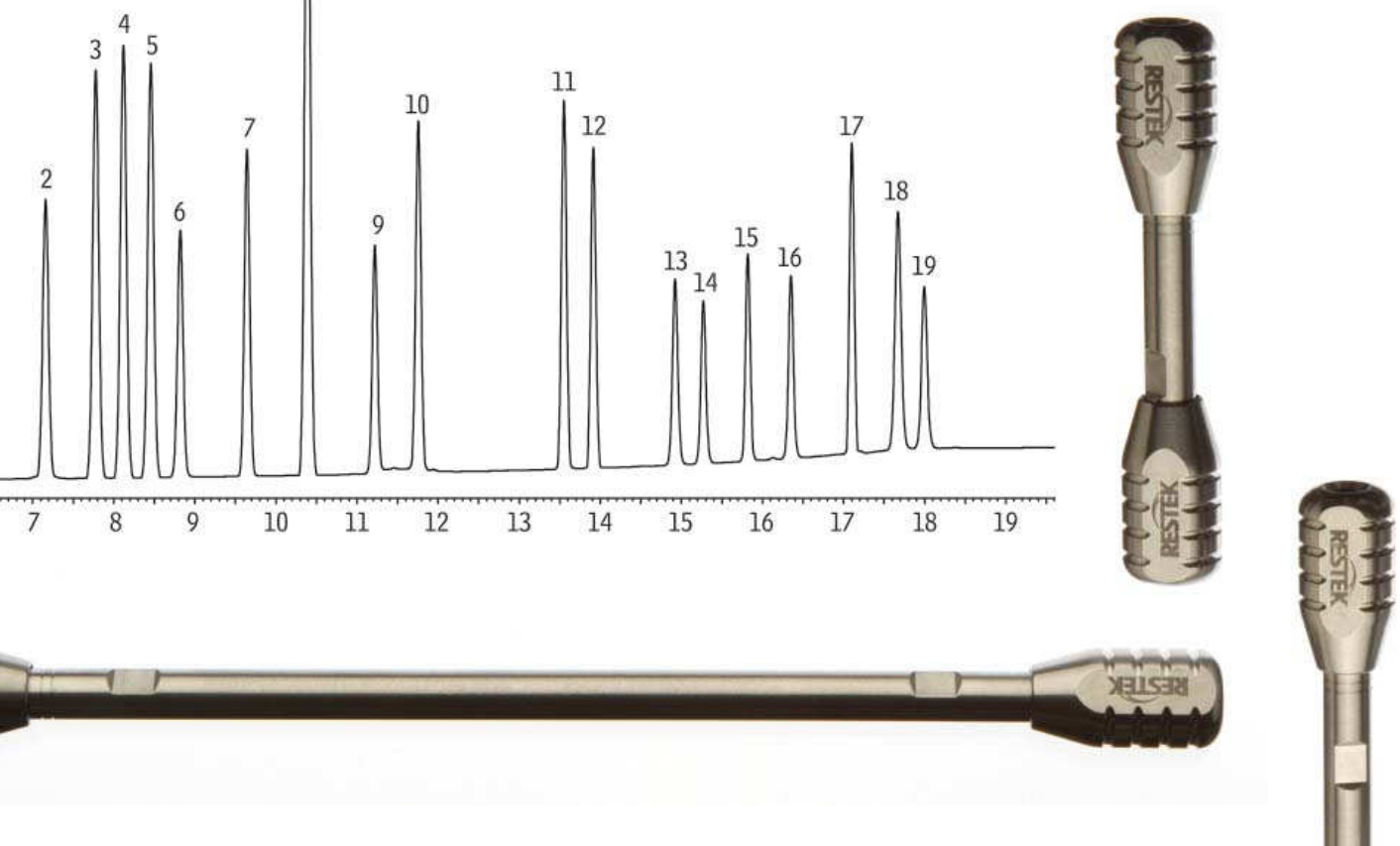


NEW!

Column	MXT®-Q-BOND, 30 m, 0.53 mm ID, 20 µm (cat.# 79716)
Sample	Solvent mix
Injection	Split
Inj. Temp.:	250 °C
Split Vent Flow Rate:	200 mL/min
Oven	
Oven Temp:	150 °C
Carrier Gas	H_2, constant flow
Linear Velocity:	40 cm/sec
Detector	FID
Instrument	Agilent/HP6890 GC

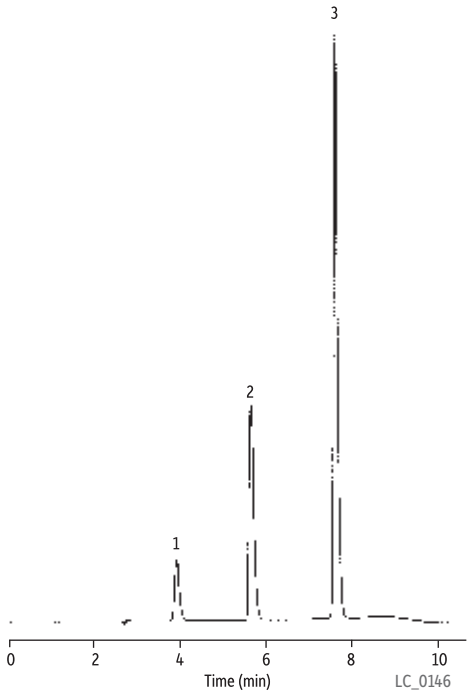
LC Chromatograms





LC Chromatograms by Column Phase

Aromatic Amino Acids on Ultra Aqueous C18



Peaks	Conc. (mg/mL)
1. Tyrosine	0.2
2. Phenylalanine	1.6
3. Tryptophan	0.4

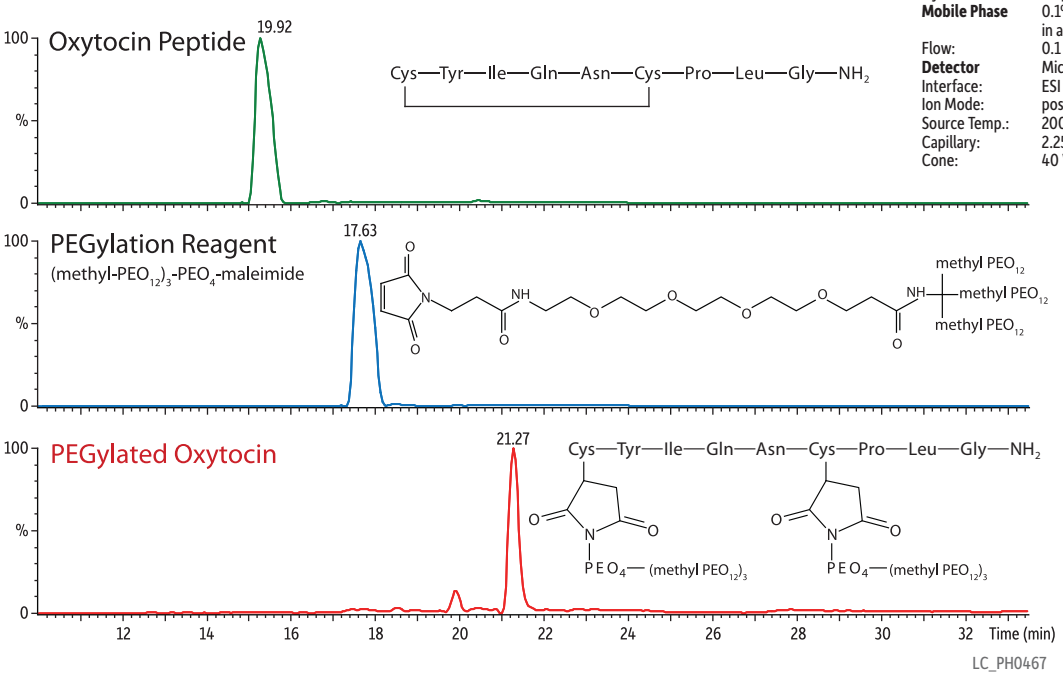
Column	Ultra Aqueous C18 (cat.# 9178565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	mobile phase A
Inj. Vol.:	20 µL
Mobile Phase	
A:	50 mM potassium phosphate, pH 2.5
B:	acetonitrile

Time (min)	%B
0-5	5–20
5-6	20–5
6–13	Hold at 5

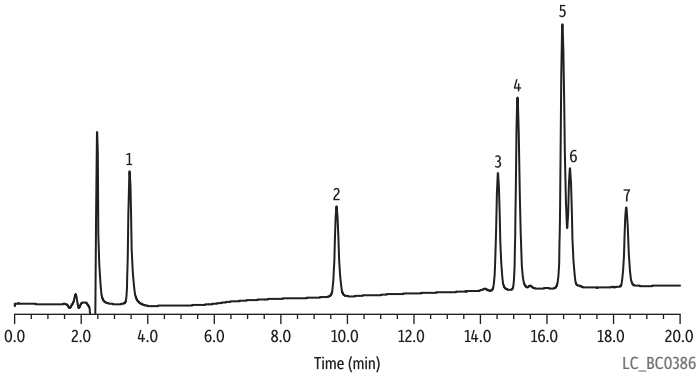
Flow:	1.0 mL/min
Detector	UV/Vis @ 254 nm

PEGylated Oxytocin on Viva C18

Column	Viva C18 (cat.# 9514561)
Dimensions:	150 mm x 1.0 mm ID
Particle Size:	5 µm
Pore Size:	300 Å
Temp.:	ambient
Sample	oxytocin PEGylation reaction products
Diluent:	0.1% formic acid in water (v:v)
Conc.:	300 pmoles/µL
Inj. Vol.:	20 µL
Mobile Phase	0.1% formic acid in water:0.1% formic acid in acetonitrile (60:40)
Flow:	0.1 mL/min
Detector	Micromass Quattro II
Interface:	ESI
Ion Mode:	pos
Source Temp.:	200 °C
Capillary:	2.25 kV
Cone:	40 V



Peptide Mix on Viva C18



Peaks
1. Val-Tyr
2. Val-Tyr-Val
3. Meth enkephalin
4. Val-4-angiotensin III
5. Angiotensin II, III
6. Leucine enkephalin
7. Angiotensin I

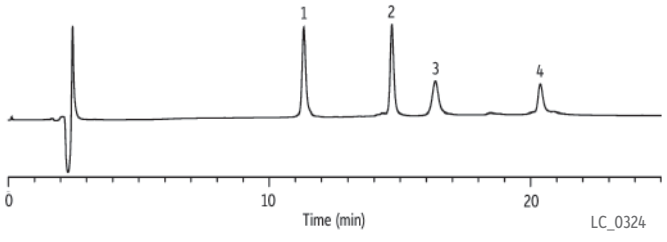
Column	Viva C18 (cat.# 9514562)
Dimensions:	150 mm x 2.1 mm ID
Particle Size:	5 µm
Pore Size:	300 Å
Temp.:	ambient
Sample	peptide test mix
Inj. Vol.:	20 µL
Mobile Phase	
A:	0.08% trifluoroacetic acid in water
B:	0.08% TFA in acetonitrile

Time (min)	%B
0	10
20	40

Flow:	0.2 mL/min
Detector	UV/Vis @ 214 nm

Protein Mix on Viva C18

Note excellent peak shapes and resolution on the Viva column!



Peaks	t_R (min)
1. Ribonuclease A	11.31
2. Cytochrome c	14.65
3. Holo-transferrin	16.32
4. Apomyoglobin	20.34

Column	Viva C18 (cat.# 9514562)
Dimensions:	150 mm x 2.1 mm ID
Particle Size:	5 µm
Pore Size:	300 Å
Temp.:	25 °C (or ambient)
Sample	
Diluent:	0.10% TFA in water:0.10% TFA in acetonitrile (80:20)
Conc.:	0.08 mg/mL each protein
Inj. Vol.:	20 µL
Mobile Phase	
A:	0.10% TFA in water
B:	0.10% TFA in acetonitrile

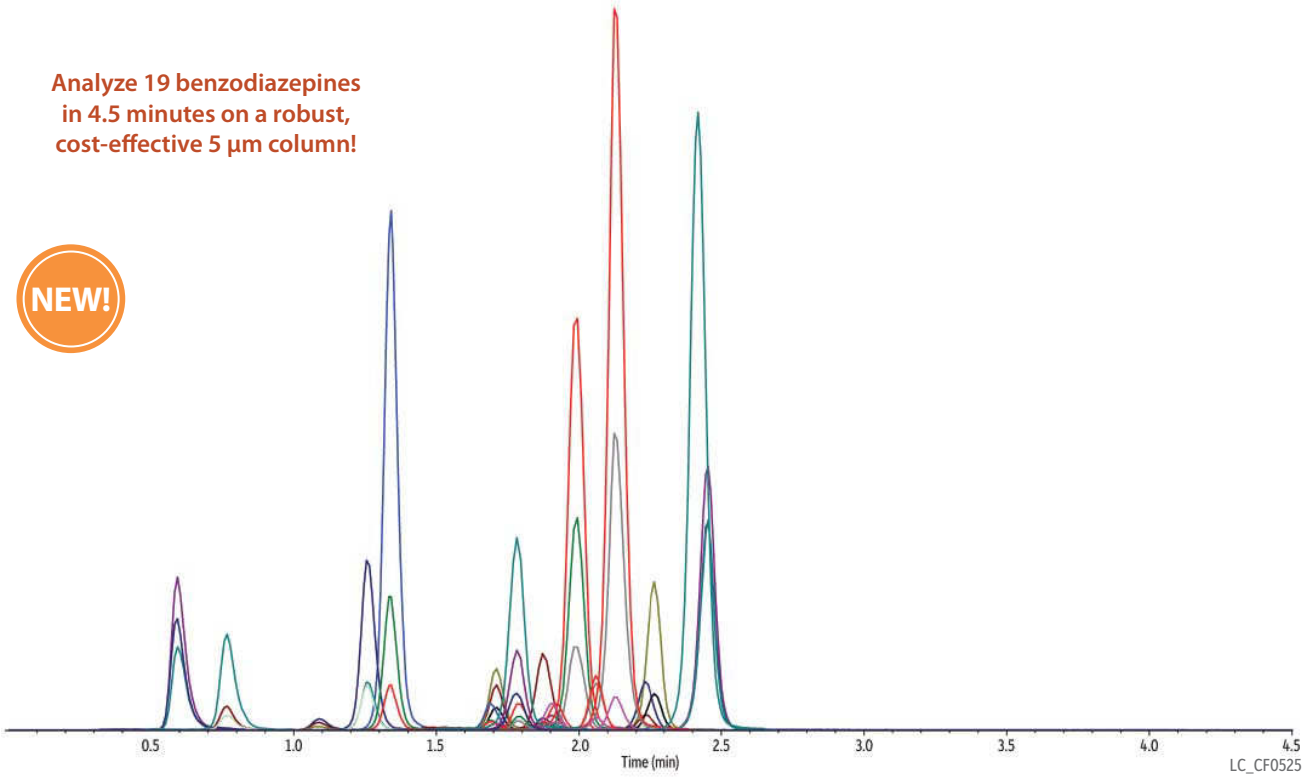
Time (min)	%B
0	20
30	70

Flow:	0.20 mL/min
Detector	UV/Vis @ 214 nm
Notes	Sample temp.: 25 °C

100 ng/mL Benzodiazepines in Hydrolyzed Urine on Ultra Biphenyl by LC-MS/MS

Analyze 19 benzodiazepines in 4.5 minutes on a robust, cost-effective 5 µm column!

NEW!



Column	Ultra Biphenyl (cat.# 9109552)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	40 °C
Sample	
Diluent:	Starting mobile phase + 30 ng/mL IS
Conc.:	100 ng/mL sample was diluted 20x prior to injection
Inj. Vol.:	30 µL
Mobile Phase	
A:	Water + 2 mM ammonium formate + 0.2% formic acid
B:	Acetonitrile + 10% water + 2 mM ammonium formate + 0.2% formic acid

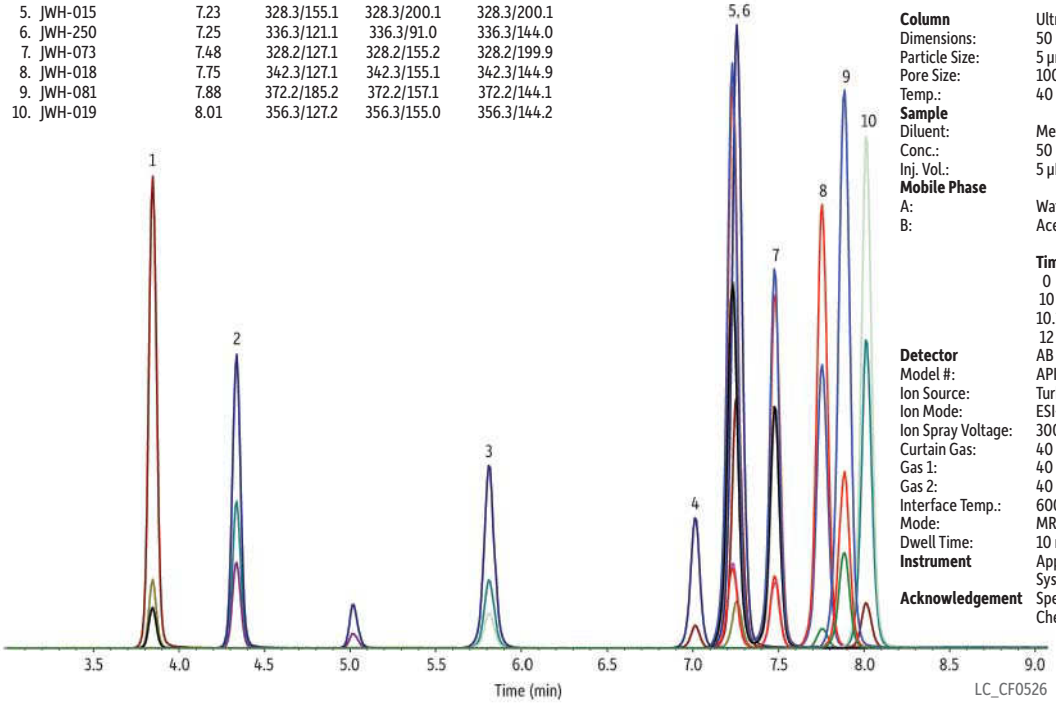
Time (min)	Flow (mL/min)	%A	%B
0	0.6	70	30
3.0	0.6	40	60
3.1	0.6	5	95
3.5	0.6	5	95
3.6	0.6	70	30
4.5	stop		

Detector	AB SCIEX API 4000 MS/MS
Model #:	API 4000
Ion Source:	TurboIonSpray®
Ion Mode:	ESI+
Ion Spray Voltage:	2 kV
Curtain Gas:	40 psi (275.8 kPa)
Gas 1:	40 psi (275.8 kPa)
Gas 2:	40 psi (275.8 kPa)
Source Temp.:	600 °C
Instrument	Applied Biosystems/MDS Sciex LC-MS/MS System
Notes	MS/MS instrument was operated in scheduled MRM mode.

	Peaks	t_R (min)	MRM1	MRM2	MRM3
1.	7-Aminoclonazepam	0.59	286.0/250.3	286.0/222.2	286.0/121.0
2.	7-Aminoflunitrazepam	0.77	284.2/135.2	284.2/240.2	284.2/226.1
3.	Bromazepam	1.10	315.9/182.0	315.9/209.1	315.9/260.9
4.	N-Desmethylflunitrazepam	1.71	300.0/254.1	300.0/225.2	300.0/198.0
5.	Nitrazepam	1.69	282.1/236.1	282.1/207.2	282.1/180.0
6.	Lorazepam	1.71	321.0/302.9	321.0/275.1	321.0/229.1
7.	2-Hydroxyethylflurazepam	1.79	333.1/246.1	333.1/166.0	333.1/109.1
8.	Nordiazepam	1.78	271.0/140.0	271.0/208.0	271.0/225.9
9.	Estazolam	1.88	294.9/267.1	294.9/241.0	294.9/138.0
10.	Desalkylflurazepam	1.90	289.0/140.0	289.0/165.1	289.0/226.0
11.	Clonazepam	1.92	315.9/270.2	315.9/214.1	315.9/207.1
12.	Alprazolam	1.99	309.4/281.1	309.4/205.0	309.4/274.1
13.	Midazolam	1.26	326.1/291.2	326.1/244.2	326.1/209.0
14.	Triazolam	2.06	343.1/315.0	343.1/308.2	343.1/239.2
15.	Temazepam	2.13	301.2/283.1	301.2/255.1	301.2/228.1
16.	Flurazepam	1.34	388.1/315.1	388.1/288.2	388.1/317.1
17.	Flunitrazepam	2.24	314.4/211.0	314.4/239.1	314.4/268.1
18.	Clobazam	2.26	301.1/259.1	301.1/224.0	301.1/181.1
19.	Diazepam-D5 (IS)	2.42	290.0/154.1	—	—
20.	Diazepam	2.45	284.8/193.1	284.8/222.2	284.8/257.1

Synthetic Cannabinoids on Ultra Biphenyl

Peaks	t_R (min)	MRM1	MRM2	MRM3
1. WIN 48098	3.85	379.2/135.2	379.2/114.3	379.2/107.3
2. JWH-200	4.34	385.3/114.0	385.3/127.0	385.3/155.0
3. WIN 55212-2	5.81	427.2/155.1	427.2/127.1	427.2/100.1
4. AM-694	7.01	436.1/309.1	436.1/231.2	—
5. JWH-015	7.23	328.3/155.1	328.3/200.1	328.3/200.1
6. JWH-250	7.25	336.3/121.1	336.3/91.0	336.3/144.0
7. JWH-073	7.48	328.2/127.1	328.2/155.2	328.2/199.9
8. JWH-018	7.75	342.3/127.1	342.3/155.1	342.3/144.9
9. JWH-081	7.88	372.2/185.2	372.2/157.1	372.2/144.1
10. JWH-019	8.01	356.3/127.2	356.3/155.0	356.3/144.2



LC_CF0526

Column
Dimensions: 50 mm x 2.1 mm ID
Particle Size: 5 µm
Pore Size: 100 Å
Temp.: 40 °C

Sample
Diluent: Methanol
Conc.: 50 ng/mL
Inj. Vol.: 5 µL

Mobile Phase
A: Water + 0.1% formic acid
B: Acetonitrile + 0.1% formic acid

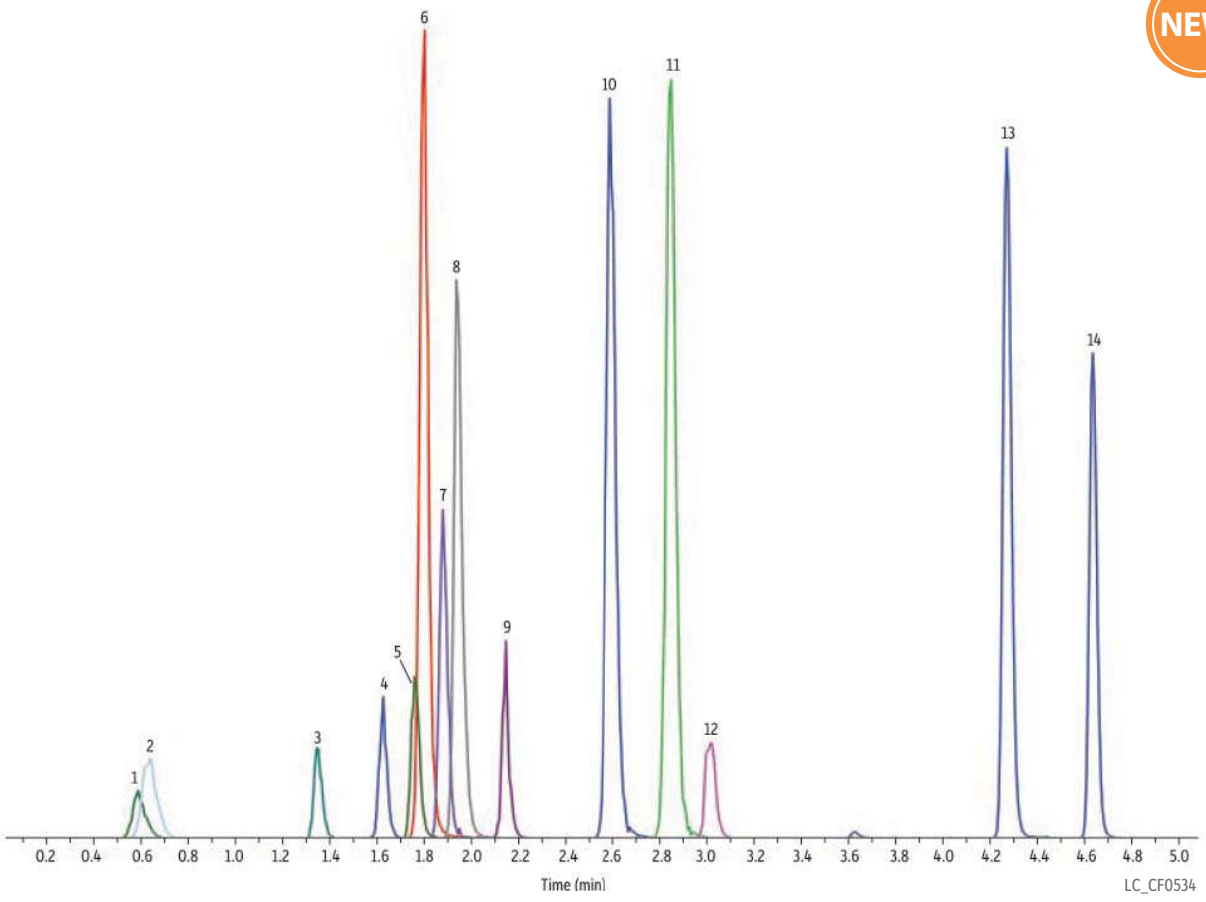
Time (min)	Flow (mL/min)	%A	%B
0	0.5	95	5
10	0.5	5	95
10.1	0.5	95	5
12	stop		

Detector AB SCIEX API 4000 MS/MS
Model #: API 4000
Ion Source: TurboIonSpray®
Ion Mode: ESI+
Ion Spray Voltage: 3000 kV
Curtain Gas: 40 psi (275.8 kPa)
Gas 1: 40 psi (275.8 kPa)
Gas 2: 40 psi (275.8 kPa)
Interface Temp.: 600 °C
Mode: MRM
Dwell Time: 10 ms
Instrument Applied Biosystems/MDS Sciex LC-MS/MS System

Acknowledgement Special thanks to Paul Kennedy and Cayman Chemical for standards.

Drugs of Abuse on Ultra Biphenyl

NEW!



Column	Ultra Biphenyl (cat.# 9109552)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	0.1% formic acid in water:0.1% formic acid in acetonitrile (98:2)
Conc.:	50 ng/mL
Inj. Vol.:	10 µL
Mobile Phase	
A:	0.1% formic acid in water
B:	0.1% formic acid in acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0	0.6	98	2
2.7	0.6	60	40
4.5	0.6	0	100
5.0	0.6	0	100
5.1	0.6	98	2

Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	API 4000
Ion Source:	TurboIonSpray®
Ion Spray Voltage:	+/- 4.5 kV
Curtain Gas:	40 psi (275.8 kPa)
Gas 1:	60 psi (413.7 kPa)
Gas 2:	60 psi (413.7 kPa)
Interface Temp.:	600 °C
Mode:	MRM
Instrument	Applied Biosystems/MDS Sciex LC-MS/MS System

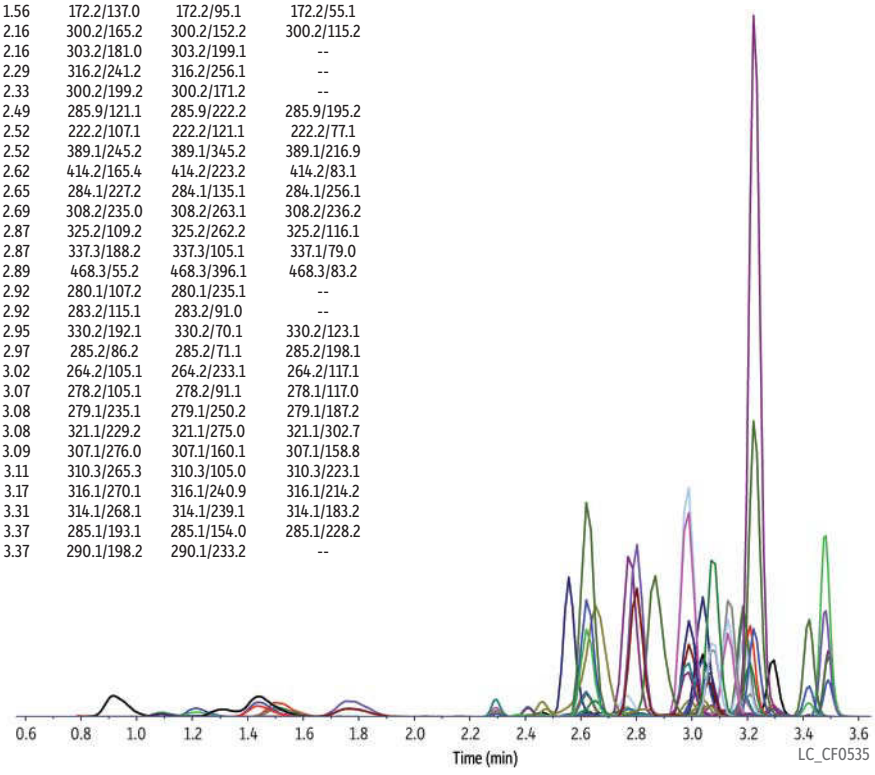
Peaks	t_R (min)	Positive MRM1	Positive MRM2	Positive MRM3	Negative MRM1	Negative MRM2	Negative MRM3
1. Ecgonine	0.58	186.1/168.2	186.1/150.9	186.1/82.2	—	—	—
2. Ecgonine methyl ester	0.62	200.2/82.2	200.2/68.2	200.2/65.1	—	—	—
3. Morphine	1.35	286.1/201.3	286.1/229.9	286.1/181.1	—	—	—
4. Amphetamine	1.63	136.0/91.0	136.0/119.1	136.0/65.0	—	—	—
5. Codeine	1.76	300.2/165.2	300.2/152.2	300.2/115.2	—	—	—
6. Methamphetamine	1.80	150.0/91.2	150.0/119.0	150.0/65.0	—	—	—
7. 6-MAM	1.88	328.1/165.1	328.1/211.1	328.1/152.2	—	—	—
8. MDMA	1.94	194.1/163.1	194.1/105.1	194.1/133.0	—	—	—
9. Benzoylecgonine	2.14	290.1/168.1	290.1/105.1	290.1/77.1	—	—	—
10. Cocaine	2.59	304.2/182.1	304.2/82.1	304.2/105.0	—	—	—
11. Cocaethylene	2.84	318.2/196.2	318.2/82.2	318.2/77.1	—	—	—
12. PCP	3.02	244.2/86.1	244.2/159.2	244.2/91.1	—	—	—
13. THC-COOH	4.27	—	—	—	343.0/299.2	343.0/190.8	343.0/245.4
14. THC	4.63	315.3/193.3	315.3/93.0	315.3/69.1	—	—	—

The instrument was operated in multi-period mode for this experiment. Period 1 was ESI+, lasting from 0.0 min to 3.5 min, Period 2 was ESI-, lasting from 3.5 min to 4.5 min, Period 3 was ESI+, lasting from 4.5 min to 6.5 min

Therapeutic Drug Monitoring Compounds in Urine by LC-MS/MS on Ultra Biphenyl

NEW!

	Peaks	t_R (min)	MRM 1	MRM 2	MRM 3
1.	Morphine	0.95	286.1/229.1	286.1/201.3	286.1/181.1
2.	Oxymorphone	1.08	302.1/227.2	302.1/198.1	302.1/115.1
3.	Pregabalin	1.29	160.2/97.1	160.2/124.1	--
4.	Hydromorphone	1.34	286.2/185.1	286.2/157.1	286.2/128.0
5.	Gabapentin	1.56	172.2/137.0	172.2/95.1	172.2/55.1
6.	Codeine	2.16	300.2/165.2	300.2/152.2	300.2/115.2
7.	Codeine-d3 (IS)	2.16	303.2/181.0	303.2/199.1	--
8.	Oxycodone	2.29	316.2/241.2	316.2/256.1	--
9.	Hydrocodone	2.33	300.2/199.2	300.2/171.2	--
10.	7-Aminoclonazepam	2.49	285.9/121.1	285.9/222.2	285.9/195.2
11.	Tapentadol	2.52	222.2/107.1	222.2/121.1	222.2/77.1
12.	Zopiclone	2.52	389.1/245.2	389.1/345.2	389.1/216.9
13.	Norbuprenorphine	2.62	414.2/165.4	414.2/223.2	414.2/83.1
14.	7-Aminoflunitrazepam	2.65	284.1/227.2	284.1/135.1	284.1/256.1
15.	Zolpidem	2.69	308.2/235.0	308.2/263.1	308.2/236.2
16.	Citalopram	2.87	325.2/109.2	325.2/262.2	325.2/116.1
17.	Fentanyl	2.87	337.3/188.2	337.3/105.1	337.1/79.0
18.	Buprenorphine	2.89	468.3/55.2	468.3/396.1	468.3/83.2
19.	Doxepin	2.92	280.1/107.2	280.1/235.1	--
20.	Doxepin-d3 (IS)	2.92	283.2/115.1	283.2/91.0	--
21.	Paroxetine	2.95	330.2/192.1	330.2/70.1	330.2/123.1
22.	Promethazine	2.97	285.2/86.2	285.2/71.1	285.2/198.1
23.	Nortriptyline	3.02	264.2/105.1	264.2/233.1	264.2/117.1
24.	Amitriptyline	3.07	278.2/105.1	278.2/91.1	278.1/117.0
25.	EDDP	3.08	279.1/235.1	279.1/250.2	279.1/187.2
26.	Lorazepam	3.08	321.1/229.2	321.1/275.0	321.1/302.7
27.	Sertraline	3.09	307.1/276.0	307.1/160.1	307.1/158.8
28.	Methadone	3.11	310.3/265.3	310.3/105.0	310.3/223.1
29.	Clonazepam	3.17	316.1/270.1	316.1/240.9	316.1/214.2
30.	Flunitrazepam	3.31	314.1/268.1	314.1/239.1	314.1/183.2
31.	Diazepam	3.37	285.1/193.1	285.1/154.0	285.1/228.2
32.	Diazepam-d5 (IS)	3.37	290.1/198.2	290.1/233.2	--



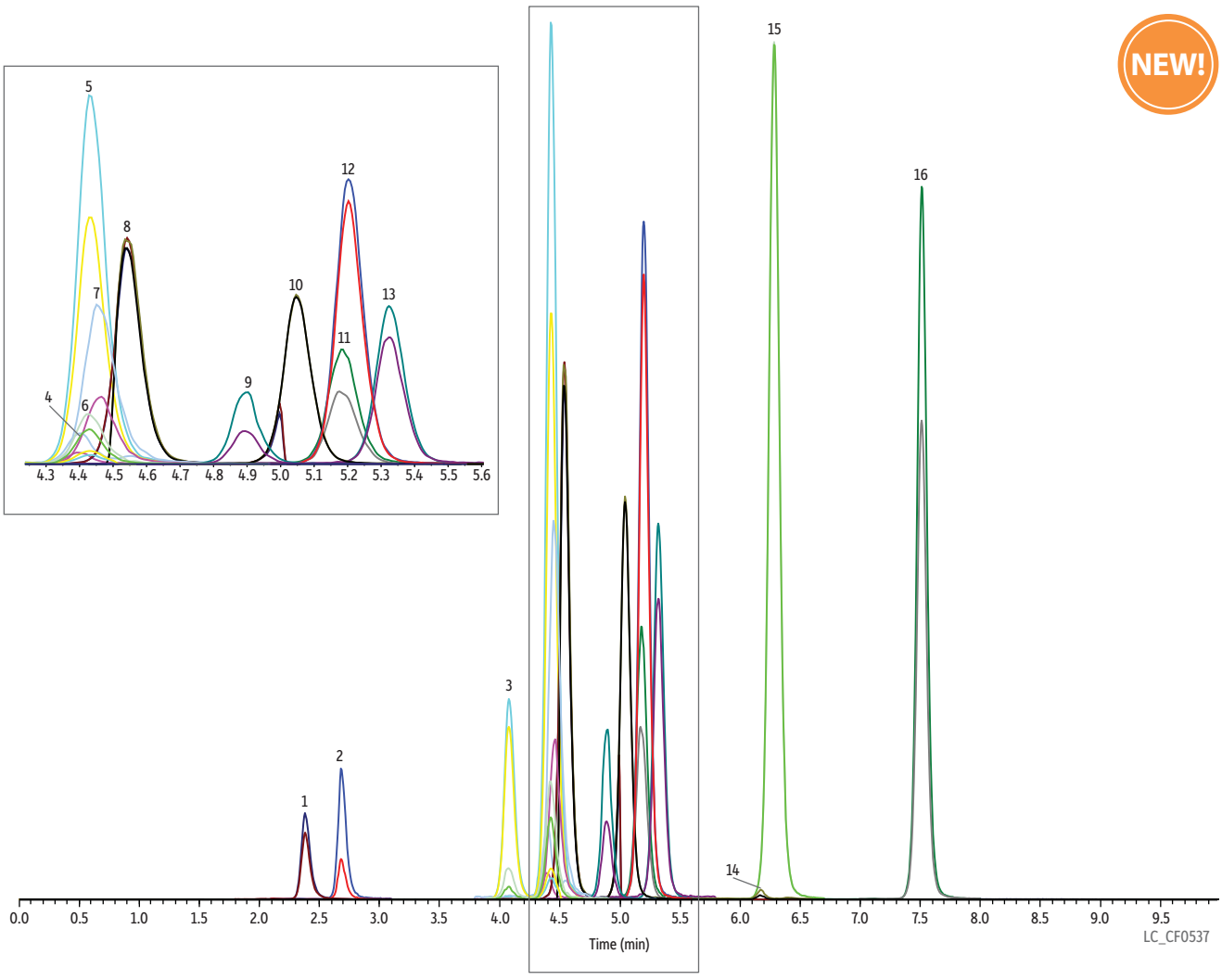
Column Ultra Biphenyl (cat.# 9109512)
Dimensions: 100 mm x 2.1 mm ID
Particle Size: 5 µm
Pore Size: 100 Å
Temp.: 30 °C
Sample
Diluent: Water:acetonitrile (90:10) + 0.1% formic acid
Conc.: 100 ng/mL (final dilution = 20x)
Inj. Vol.: 30 µL
Mobile Phase
A: Water + 0.1% formic acid
B: Acetonitrile + 0.1% formic acid

Time (min)	Flow (mL/min)	%A	%B
0	0.6	90	10
1.00	0.6	90	10
3.5	0.6	0	100
4.0	0.6	0	100
4.1	0.6	90	10
5.5	0.6	90	10

Detector AB SCIEX API 4000 MS/MS
Model #: API 4000
Ion Source: TurboIonSpray®
Ion Mode: ESI+
Ion Spray Voltage: 3,000 kV
Curtain Gas: 40 psi (275.8 kPa)
Gas 1: 60 psi (413.7 kPa)
Gas 2: 60 psi (413.7 kPa)
Interface Temp.: 600 °C
Mode: MRM
Instrument API LC-MS/MS
Notes A 5 µm, 10 mm x 2.1 mm Ultra Biphenyl guard column (cat.# 910950212) was used in conjunction with this analysis.

Sample was prepared as follows:
- Fortify urine at 100 ng/mL.
- To 1 mL of urine, add 1 mL of 100 mM ammonium acetate (pH = 5.6) containing 2,000 units of β-glucuronidase from *E. coli* (Sigma-Aldrich cat# G7396).
- Incubate for 90 minutes at 37 °C.
- Centrifuge at 3,000 rpm for 15 minutes.
- Dilute 100 µL of sample with 900 µL of water:acetonitrile (90:10) + 0.1% formic acid containing 4 ng/mL internal standard. (Total dilution factor = 20x)

Steroid Panel Analysis on the Ultra Biphenyl



Column	Ultra Biphenyl (cat.# 9109512)
Dimensions:	100 mm x 2.1 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	Steroids panel
Diluent:	Methanol:water (50:50)
Conc.:	5 ng/mL
Inj. Vol.:	50 µL
Mobile Phase	
A:	0.1% formic acid in water
B:	0.1% formic acid in methanol

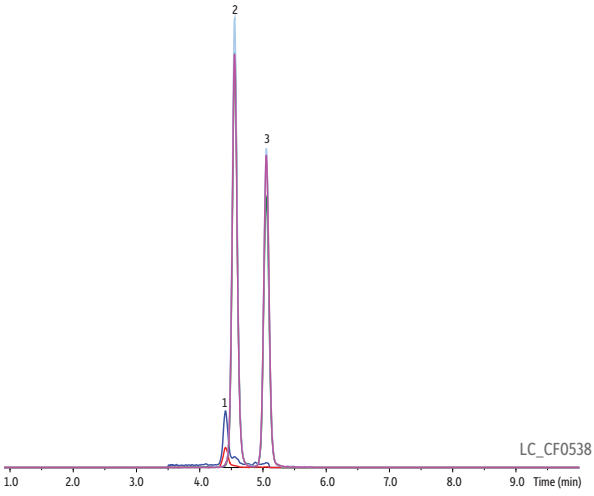
Time (min)	Flow (mL/min)	%A	%B
0.00	0.4	30	70
8.00	0.4	0	100
8.01	0.4	30	70
10.00	0.4	30	70

Max Pressure:	250 bar
Detector	AB SCIEX MS/MS
Model #:	API 4000
Ion Source:	TurboIonSpray®
Ion Mode:	ESI+
Ion Spray Voltage:	5.5 kV
Curtain Gas:	25 psi (172.4 kPa)
Gas 1:	40 psi (275.8 kPa)
Gas 2:	40 psi (275.8 kPa)
Source Temp.:	350 °C
Mode:	Scheduled MRM
Instrument	API LC-MS/MS
Notes	CAD: 8 psi (55.2 kPa) MRM detection window: 60 sec Target scan time: 0.55 sec

Peaks	t_R (min)	Q1	Q3 Quantifier	Q3 Qualifier
1. Cortisol	2.3	363.3	121.2	327.2
2. Estradiol	2.6	255.3	159.1	133.1
3. 11-Deoxycortisol	4.0	347.4	109.2	97.1
4. DHEA	4.3	271.3	253.2	213.2
5. Boldenone	4.4	287.2	121.2	135.2
6. Corticosterone	4.4	347.4	329.2	121.1
7. Stanozolol	4.4	329.3	81.1	95.1
8. Epitestosterone	4.5	289.2	109.2	97.1
9. 17-OH-progesterone	4.8	331.3	97.2	109.5
10. Testosterone	5.0	289.2	109.1	97.0
11. Trenbolone	5.1	303.3	109.2	97.1
12. Methyltestosterone	5.1	271.2	253.1	199.2
13. Nandrolone	5.3	275.2	109.2	257.3
14. 25-Hydroxyvitamin D3	6.1	383.3	365.3	107.1
15. Androstenedione	6.2	287.2	97.1	109.2
16. Progesterone	7.5	315.3	109.2	97.1

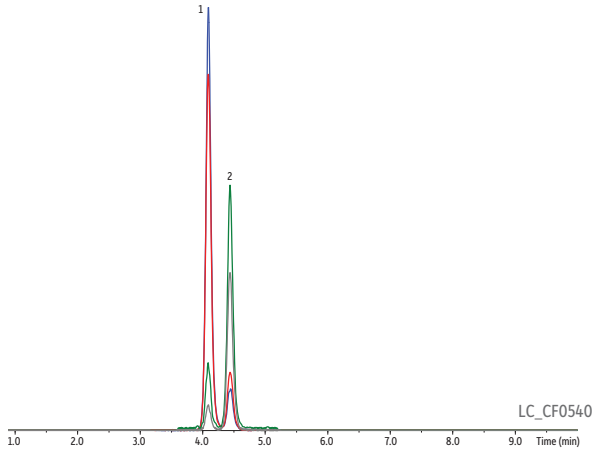
Isobaric Steroids (DHEA, Epitestosterone, and Testosterone) on Ultra Biphenyl

Peaks	t_R (min)	Q1	Q3 Quantifier	Q3 Qualifier
1. DHEA	4.3	271.3	253.2	213.2
2. Epitestosterone	4.5	289.2	109.2	97.1
3. Testosterone	5.0	289.2	109.1	97.0



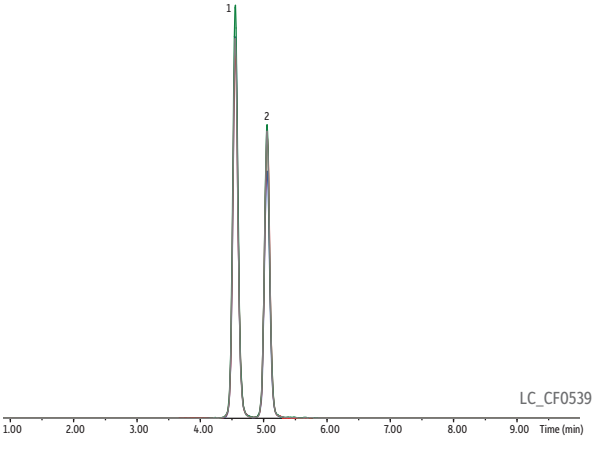
Isobaric Steroids (11-Deoxycortisol and Corticosterone) on Ultra Biphenyl

Peaks	t_R (min)	Q1	Q3 Quantifier	Q3 Qualifier
1. 11-Deoxycortisol	4.0	347.4	109.2	97.1
2. Corticosterone	4.4	347.4	329.2	121.1



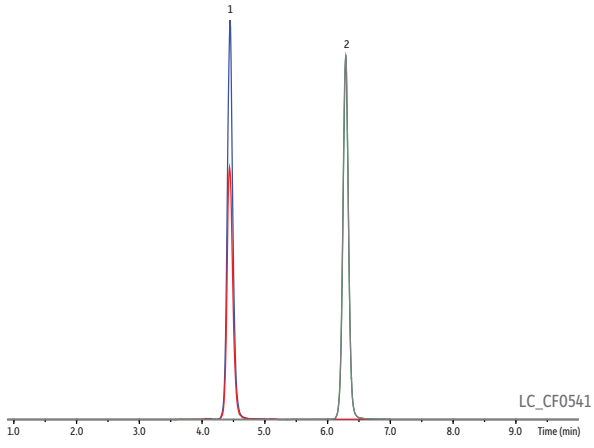
Isobaric Steroids (Epitestosterone and Testosterone) on Ultra Biphenyl

Peaks	t_R (min)	Q1	Q3 Quantifier	Q3 Qualifier
1. Epitestosterone	4.5	289.2	109.2	97.1
2. Testosterone	5.0	289.2	109.1	97.0



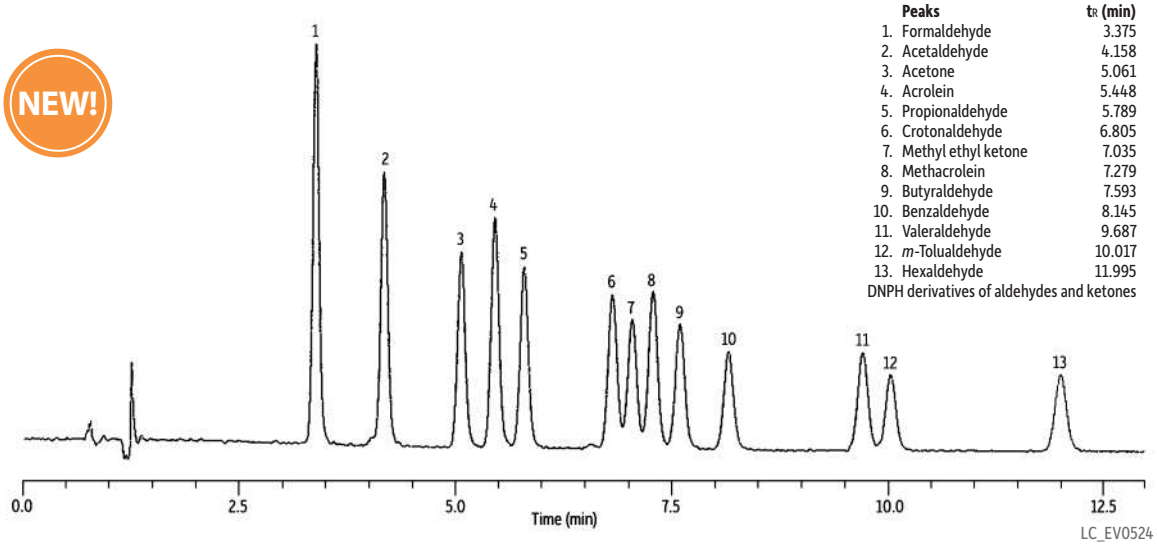
Isobaric Steroids (Boldenone and Androstenedione) on Ultra Biphenyl

Peaks	t_R (min)	Q1	Q3 Quantifier	Q3 Qualifier
1. Boldenone	4.4	287.2	121.2	135.2
2. Androstenedione	6.2	287.2	97.1	109.2



These chromatograms were generated using the same conditions that are listed on page 698.

CARB 1004 Aldehyde/Ketone-DNPH Calibration Standard on Ultra C18



Peaks	t_R (min)
1. Formaldehyde	3.375
2. Acetaldehyde	4.158
3. Acetone	5.061
4. Acrolein	5.448
5. Propionaldehyde	5.789
6. Crotonaldehyde	6.805
7. Methyl ethyl ketone	7.035
8. Methacrolein	7.279
9. Butyraldehyde	7.593
10. Benzaldehyde	8.145
11. Valeraldehyde	9.687
12. *m*-Tolualdehyde	10.017
13. Hexaldehyde	11.995

DNPH derivatives of aldehydes and ketones

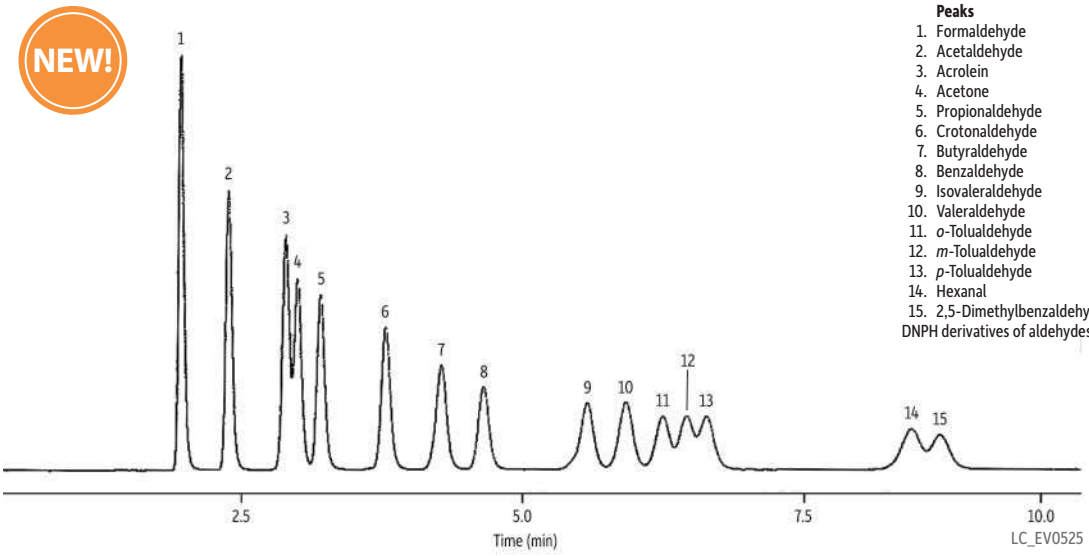
Column	Ultra C18 (cat.# 9174565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	25 °C
Sample	CARB 1004 Aldehyde/Ketone-DNPH Calibration Standard (cat.# 33093)
Diluent:	Acetonitrile
Conc.:	3 µg/mL each
Inj. Vol.:	10 µL

Mobile Phase	
A:	Water:Tetrahydrofuran (5:2)
B:	Acetonitrile

Time (min)	%B
0	30
13	60

Flow:	1.5 mL/min
Max Pressure:	187 bar
Detector	UV/Vis @ 365, 1 nm
Instrument	Shimadzu UFLCXR

Aldehyde-Ketone-DNPH Calibration Mix on Ultra C18 by EPA TO-11A



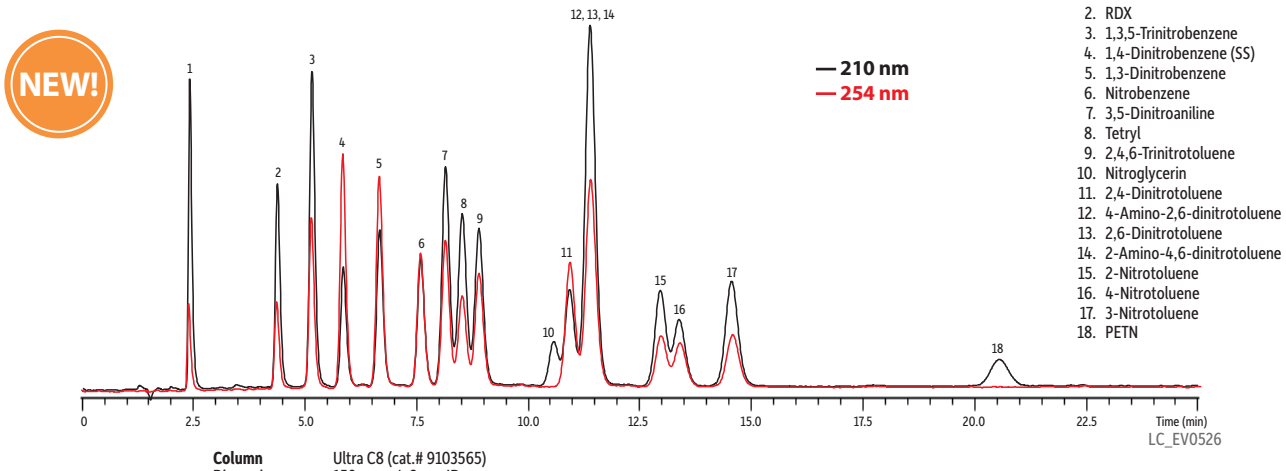
Peaks	t_R (min)
1. Formaldehyde	1.954
2. Acetaldehyde	2.376
3. Acrolein	2.884
4. Acetone	2.987
5. Propionaldehyde	3.190
6. Crotonaldehyde	3.777
7. Butyraldehyde	4.273
8. Benzaldehyde	4.653
9. Isovaleraldehyde	5.572
10. Valeraldehyde	5.919
11. *o*-Tolualdehyde	6.242
12. *m*-Tolualdehyde	6.454
13. *p*-Tolualdehyde	6.634
14. Hexanal	8.450
15. 2,5-Dimethylbenzaldehyde	8.715

DNPH derivatives of aldehydes and ketones

Column	Ultra C18 (cat.# 9174565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	25 °C
Sample	Aldehyde-Ketone-DNPH TO-11A Calibration Mix (cat.# 31808)
Diluent:	Acetonitrile
Conc.:	15 µg/mL each
Inj. Vol.:	10 µL

Mobile Phase	Water:Acetonitrile (30:70)
Flow:	1.5 mL/min
Max Pressure:	107 bar
Detector	UV/Vis @ 365, 1 nm
Instrument	Shimadzu UFLCXR

Explosives by EPA 8330B on Ultra C8 with Trident Direct Guard Column

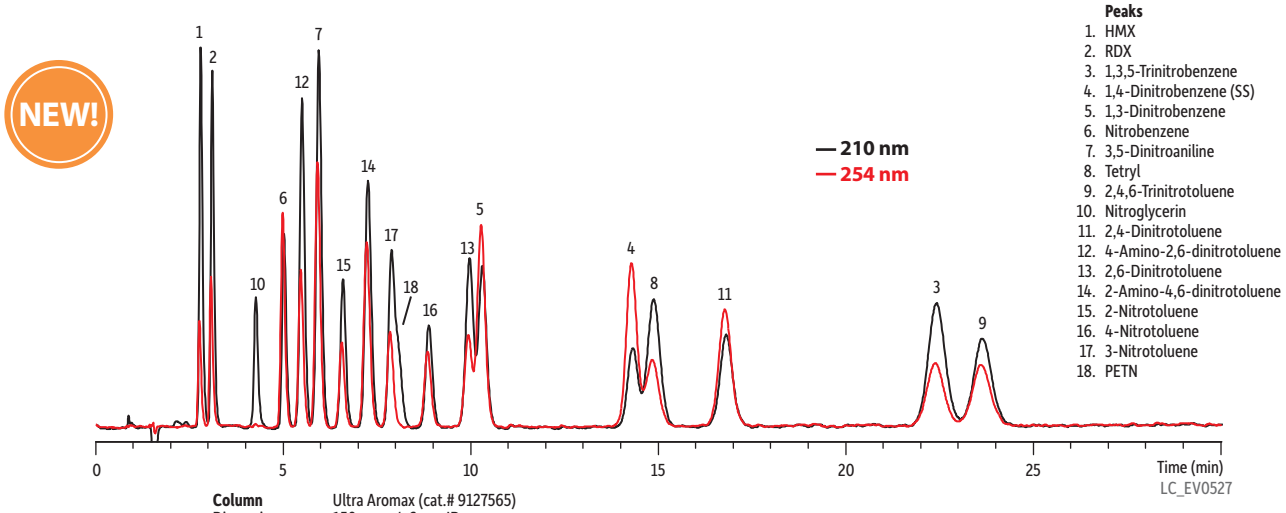


Peaks
1. HMX
2. RDX
3. 1,3,5-Trinitrobenzene
4. 1,4-Dinitrobenzene (SS)
5. 1,3-Dinitrobenzene
6. Nitrobenzene
7. 3,5-Dinitroaniline
8. Tetryl
9. 2,4,6-Trinitrotoluene
10. Nitroglycerin
11. 2,4-Dinitrotoluene
12. 4-Amino-2,6-dinitrotoluene
13. 2,6-Dinitrotoluene
14. 2-Amino-4,6-dinitrotoluene
15. 2-Nitrotoluene
16. 4-Nitrotoluene
17. 3-Nitrotoluene
18. PETN

Column	Ultra C8 (cat.# 9103565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	8330B Nitroaromatics and nitramine mix (cat.# 33204) 1,4-Dinitrobenzene (cat.# 33205)
Diluent:	Deionized water
Conc.:	20 µg/mL
Inj. Vol.:	10 µL
Mobile Phase	Water:methanol (52:48)
Flow:	1.2 mL/min
Detector	UV/Vis @ 210/254 nm
Instrument	Shimadzu UFLCXR
Notes	Trident direct 10 mm in-line guard cartridge holder (cat.# 25083) Ultra C8 10 mm x 4 mm guard cartridge (cat.# 910350210)

This is the recommended primary column for a 2 column analysis. See LC_EV0527 (below) for the confirmation column.

Explosives by EPA 8330B on Ultra Aromax with Trident Direct Guard

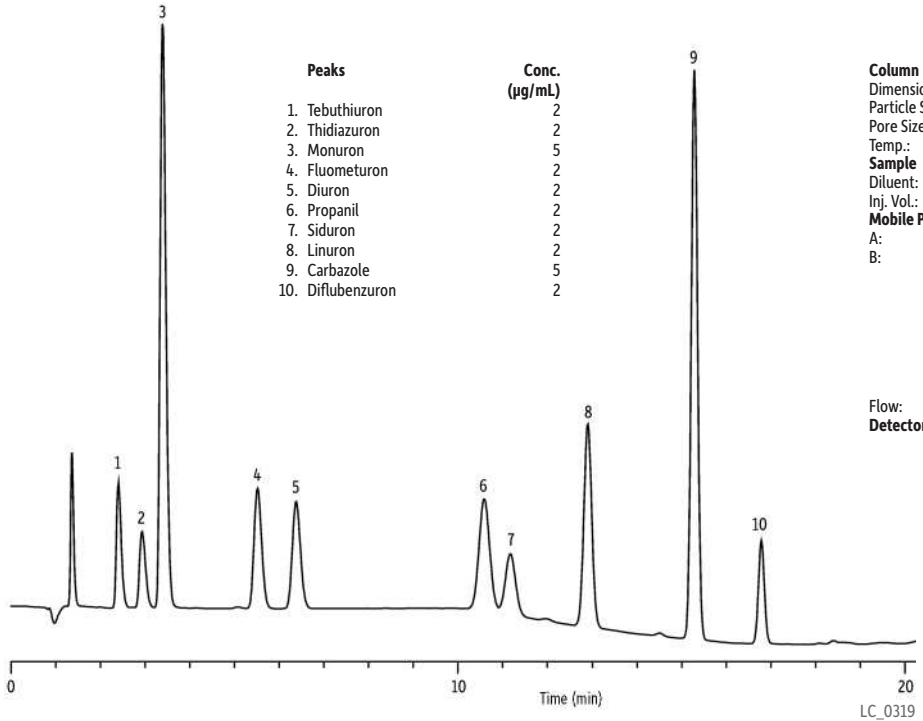


Peaks
1. HMX
2. RDX
3. 1,3,5-Trinitrobenzene
4. 1,4-Dinitrobenzene (SS)
5. 1,3-Dinitrobenzene
6. Nitrobenzene
7. 3,5-Dinitroaniline
8. Tetryl
9. 2,4,6-Trinitrotoluene
10. Nitroglycerin
11. 2,4-Dinitrotoluene
12. 4-Amino-2,6-dinitrotoluene
13. 2,6-Dinitrotoluene
14. 2-Amino-4,6-dinitrotoluene
15. 2-Nitrotoluene
16. 4-Nitrotoluene
17. 3-Nitrotoluene
18. PETN

Column	Ultra Aromax (cat.# 9127565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	35 °C
Sample	8330B Nitroaromatics and nitramine mix (cat.# 33204) 1,4-Dinitrobenzene (cat.# 33205)
Diluent:	Deionized water
Conc.:	20 µg/mL
Inj. Vol.:	10 µL
Mobile Phase	Water:methanol (30:70)
Flow:	1.2 mL/min
Detector	UV/Vis @ 210/254 nm
Instrument	Shimadzu UFLCXR
Notes	Trident direct 10 mm in-line guard cartridge holder (cat.# 25083) Ultra Aromax 10 mm x 4 mm guard cartridge (cat.# 912750210)

This is the recommended confirmation column for a 2 column analysis. See LC_EV0526 (above) for the primary column.

Herbicides (Phenylurea) on Ultra C18



LC_0319

Peaks	Conc. (µg/mL)
1. Tebuthiuron	2
2. Thidiazuron	2
3. Monuron	5
4. Fluometuron	2
5. Diuron	2
6. Propanil	2
7. Siduron	2
8. Linuron	2
9. Carbazole	5
10. Diflubenzuron	2

Column	Ultra C18 (cat.# 9174565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	acetonitrile
Inj. Vol.:	20 µL
Mobile Phase	
A:	25 mM phosphate buffer, pH 2.5
B:	acetonitrile

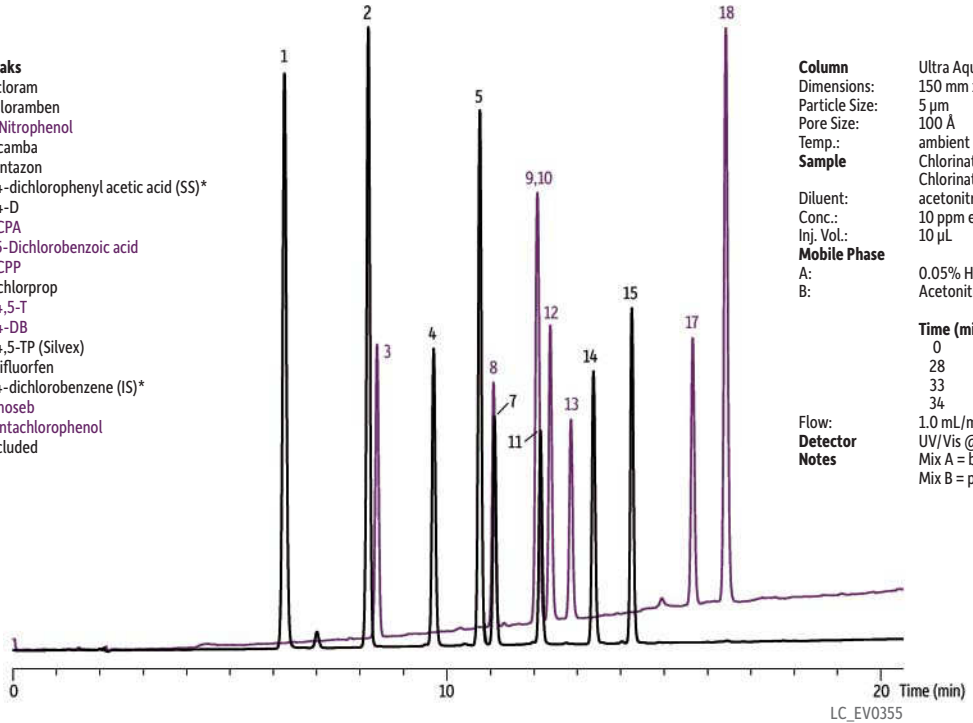
Time (min)	%B
0	40
8	40
14	55
18	55
19	40

Flow:	1.5 mL/min
Detector	UV/Vis @ 245 nm

Phenoxyacid Herbicides on Ultra Aqueous C18

Peaks
1. Picloram
2. Chloramben
3. 4-Nitrophenol
4. Dicamba
5. Bentazon
6. 2,4-dichlorophenyl acetic acid (SS)*
7. 2,4-D
8. MCPA
9. 3,5-Dichlorobenzoic acid
10. MCPP
11. Dichlorprop
12. 2,4,5-T
13. 2,4-DB
14. 2,4,5-TP (Silvex)
15. Acifluorfen
16. 1,4-dichlorobenzene (IS)*
17. Dinoseb
18. Pentachlorophenol

* Not included



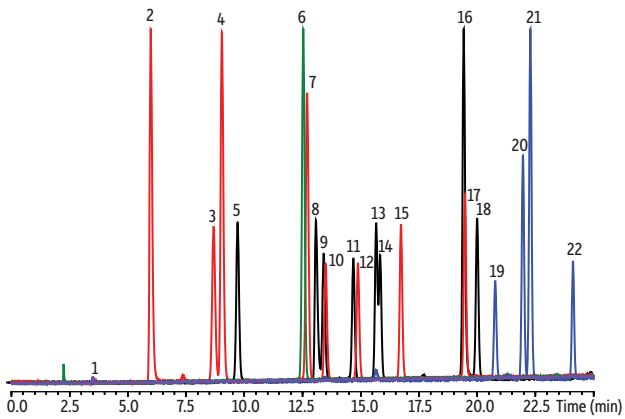
LC_EV0355

Column	Ultra Aqueous C18 (cat.# 9178565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	Chlorinated Acids by HPLC, Mix A (cat.# 32431) Chlorinated Acids by HPLC, Mix B (cat.# 32430)
Diluent:	acetonitrile
Conc.:	10 ppm each analyte
Inj. Vol.:	10 µL
Mobile Phase	
A:	0.05% H_3PO_4
B:	Acetonitrile

Time (min)	%B
0	20
28	80
33	90
34	20

Flow:	1.0 mL/min
Detector	UV/Vis @ 225 nm
Notes	Mix A = black trace Mix B = purple trace

Phenoxyacid Herbicides on Ultra Cyano (Overlay)



LC_EV0528

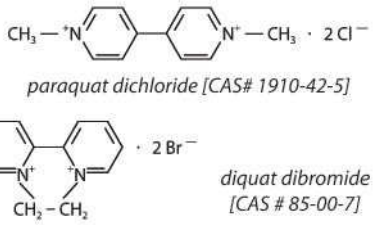
Column	Ultra Cyano (cat.# 9106565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	Chlorinated acids by HPLC, mix B (cat.# 32430) Chlorinated acids by HPLC, mix A (cat.# 32431) Dalapon (cat.# 32432) 2,4-Dichlorophenylacetic acid (cat.# 32439)
Diluent:	Water
Inj. Vol.:	5 µL
Mobile Phase	
A:	0.05% H_3PO_4 in water
B:	Acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0.00	1	90	10
25	1	35	65

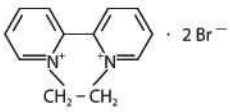
Detector	UV/Vis @ 220, 0 nm
Instrument	Shimadzu UFLCXR
Notes	Overlay of 5 injections 1. Black trace = cat.# 32430 2. Red trace = cat.# 32431 3. Purple trace = cat.# 32432 4. Green trace = cat.# 32439 5. Blue trace = metabolite mix

	Peaks	t_R (min)	Conc. (µg/mL)
1.	Dalapon	3.49	100
2.	Picloram	5.98	100
3.	Dicamba	8.68	100
4.	Chloramben	9.04	100
5.	4-Nitrophenol	9.71	100
6.	2,4-Dichlorophenylacetic acid	12.53	40
7.	Bentazon	12.70	100
8.	(4-Chloro-*o*-toloxy)acetic acid	13.07	100
9.	3,5-Dichlorobenzoic acid	13.41	100
10.	2,4-D	13.49	100
11.	Mecoprop	14.68	100
12.	Dichlorprop	14.88	100
13.	2,4,5-T	15.66	100
14.	2,4-DB	15.83	100
15.	2,4,5-TP	16.73	100
16.	Phenol, pentachloro-	19.42	100
17.	Acifluorfen	19.47	100
18.	Dinoseb	20.00	100
19.	2,4-D Butoxyethyl ester	20.78	200
20.	2,4,5-T Butoxyethyl ester	21.97	200
21.	2,4,5-T Butyl ester	22.29	200
22.	2,4-D 2-Ethylhexyl ester	24.12	200

Paraquat and Diquat on Ultra Quat

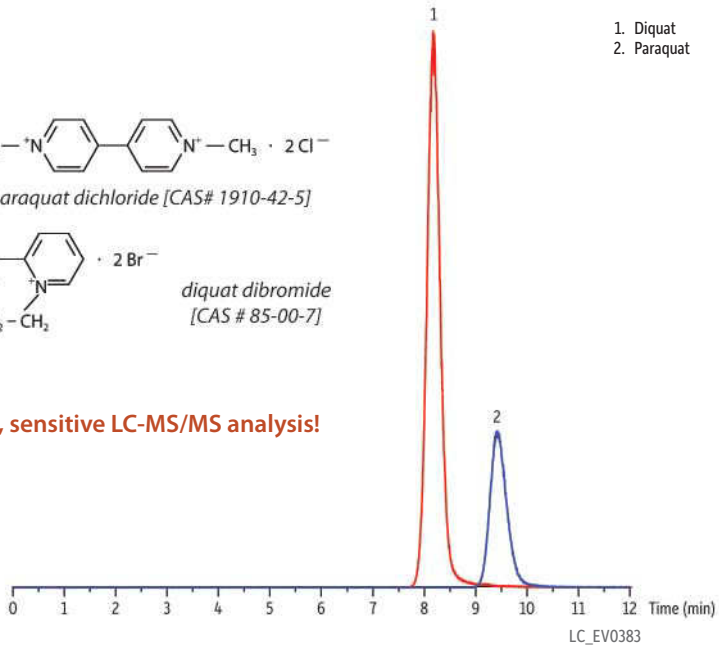


paraquat dichloride [CAS# 1910-42-5]



diquat dibromide [CAS # 85-00-7]

Fast, sensitive LC-MS/MS analysis!

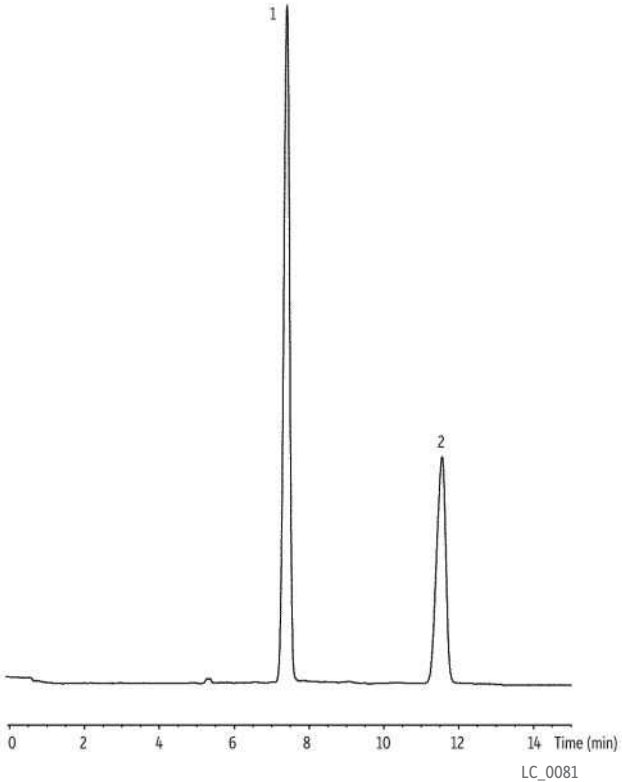


LC_EV0383

Peaks	Precursor Ion (amu)	Fragment Ion (amu)	DP (V)	Collision Energy (eV)
1. Diquat	183+	157+	30	30
2. Paraquat	93 (2+)	171+	20	20

Column	Ultra Quat (cat.# 9181352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	DI Water
Conc.:	5 µg/mL each component
Inj. Vol.:	10 µL
Mobile Phase	10 mM heptafluorobutyric acid:acetonitrile (95:5)
Flow:	0.3 mL/min
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	API 3200™ MS/MS system
Ion Source:	Electrospray
Ion Mode:	ESI+
Ion Spray Voltage:	5.5 kV
Curtain Gas:	15 psi (103.4 kPa)
Gas 1:	70 psi (482.6 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	600 °C
Mode:	MRM
Dwell Time:	200 ms
Instrument	Applied Biosystems/MDS Sciex LC-MS/MS System
Notes	Collision exit potential: 3V Q1/Q3: unit resolution
Acknowledgement	Data courtesy of Houssain El Aribi, Ph.D., LC/MS Product and Application Specialist, MDS SCIEX, 71 Four Valley Drive, Concord, Ontario, Canada, L4K 4V8

Pesticide (Diflubenzuron) on Ultra IBD

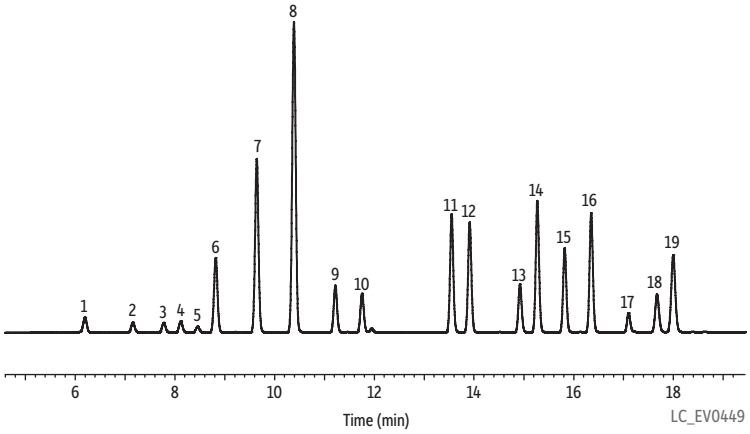


LC_0081

Peaks
1. Diflubenzuron
2. N,N'-bis-(chlorobenzyl)urea

Column	Ultra IBD (cat.# 9175365)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	water:acetonitrile (1:1 v/v)
Conc.:	1 mg/mL
Inj. Vol.:	10 µL
Mobile Phase	water:acetonitrile (45:55 v/v)
Flow:	1.0 mL/min
Detector	UV/Vis @ 260 nm

Polycyclic Aromatic Hydrocarbons on Pinnacle® II PAH EPA 8310 18 component standard + benzo(j)fluoranthene



Peaks		t_R (min)
1.	Naphthalene	6.19
2.	Acenaphthylene	7.16
3.	1-Methylnaphthalene	7.78
4.	2-Methylnaphthalene	8.17
5.	Acenaphthene	8.46
6.	Fluorene	8.82
7.	Phenanthrene	9.64
8.	Anthracene	10.39
9.	Fluoranthene	11.22
10.	Pyrene	11.75
11.	Benz[a]anthracene	13.55
12.	Chrysene	13.91
13.	Benzo[j]fluoranthene	14.92
14.	Benzo[b]fluoranthene	15.27
15.	Benzo[k]fluoranthene	15.82
16.	Benzo[a]pyrene	16.35
17.	Dibenz[a,h]anthracene	17.10
18.	Benzo[ghi]perylene	17.67
19.	Indeno[1,2,3-cd]pyrene	17.99

Column	Pinnacle® II PAH (cat.# 9219463)
Dimensions:	150 mm x 3.2 mm ID
Particle Size:	4 µm
Pore Size:	110 Å
Temp.:	30 °C
Sample	
Diluent:	acetonitrile
Conc.:	20 µg/mL each component
Inj. Vol.:	10 µL

Mobile Phase	
A:	purified water
B:	acetonitrile

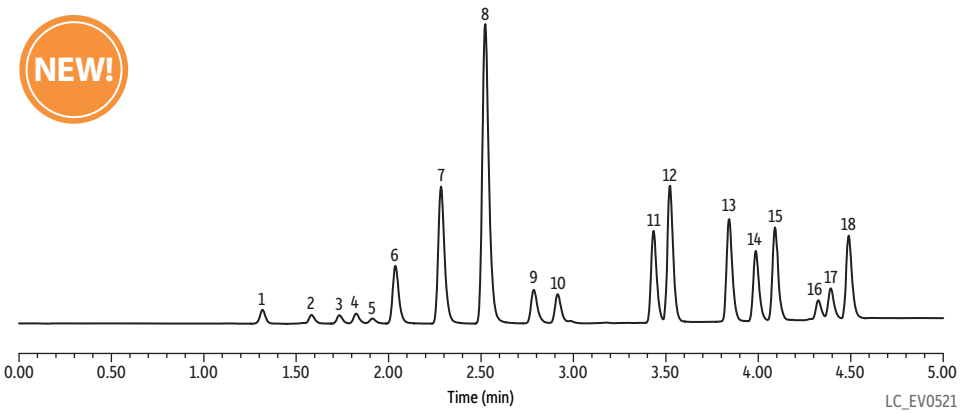
Time (min)	%B
0	40
7	60
16	100
18.9	100
19	40

Flow:	1.2 mL/min
Detector	UV/Vis @ 254 nm
Instrument	Shimadzu Prominence

For more PAH chromatograms, visit www.restek.com/chromatograms

EPA 8310 PAH Mix on Pinnacle® DB PAH

NEW!



Peaks
1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

Column	Pinnacle® DB PAH (cat.# 9470252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	EPA Method 8310 PAH Mixture (cat.# 31841)
Diluent:	acetonitrile
Conc.:	10 µg/mL
Inj. Vol.:	1 µL

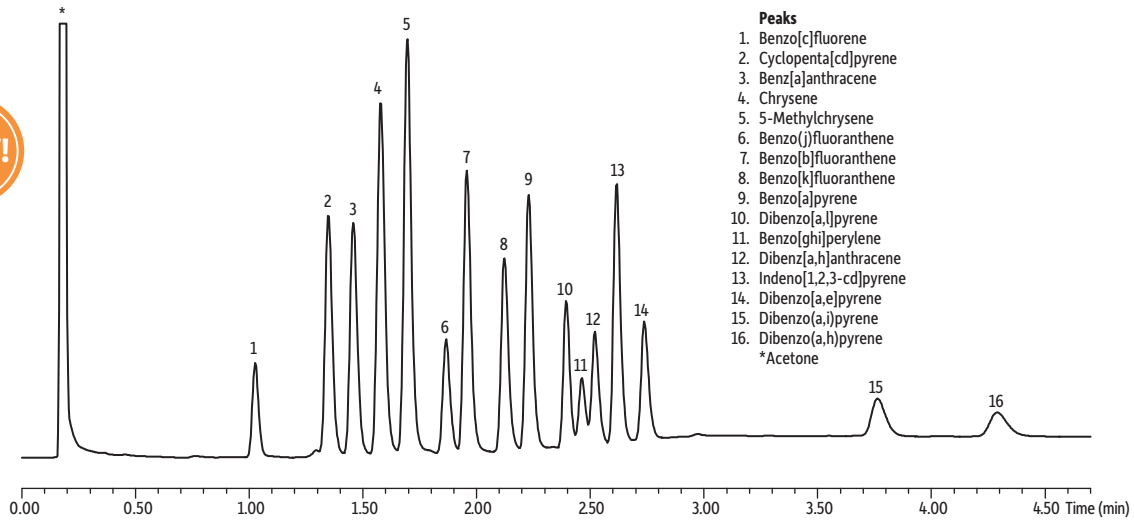
Mobile Phase	
A:	water
B:	acetonitrile

Time (min)	Flow (mL/min)	%A	%B
0	0.8	60	40
2	0.8	40	60
4	0.8	0	100
4.5	0.8	0	100
4.51	0.8	60	40
5	0.8	60	40

Max Pressure:	724 bar
Detector	Photo diode array @ 254, 4.8 nm
Instrument	Waters

EU 15+1 PAH Mix on Pinnacle® DB PAH

NEW!



LC_FF0513

Peaks
1. Benzo[c]fluorene
2. Cyclopenta[cd]pyrene
3. Benz[a]anthracene
4. Chrysene
5. 5-Methylchrysene
6. Benzo(j)fluoranthene
7. Benzo[b]fluoranthene
8. Benzo[k]fluoranthene
9. Benzo[a]pyrene
10. Dibenzo[a,l]pyrene
11. Benzo[ghi]perylene
12. Dibenz[a,h]anthracene
13. Indeno[1,2,3-cd]pyrene
14. Dibenzo[a,e]pyrene
15. Dibenzo(a,i)pyrene
16. Dibenzo(a,h)pyrene

*Acetone

Column	Pinnacle® DB PAH (cat.# 9470252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	Custom EU 15+1 PAH Mix
Diluent:	Acetonitrile
Conc.:	10 µg/mL
Inj. Vol.:	1 µL

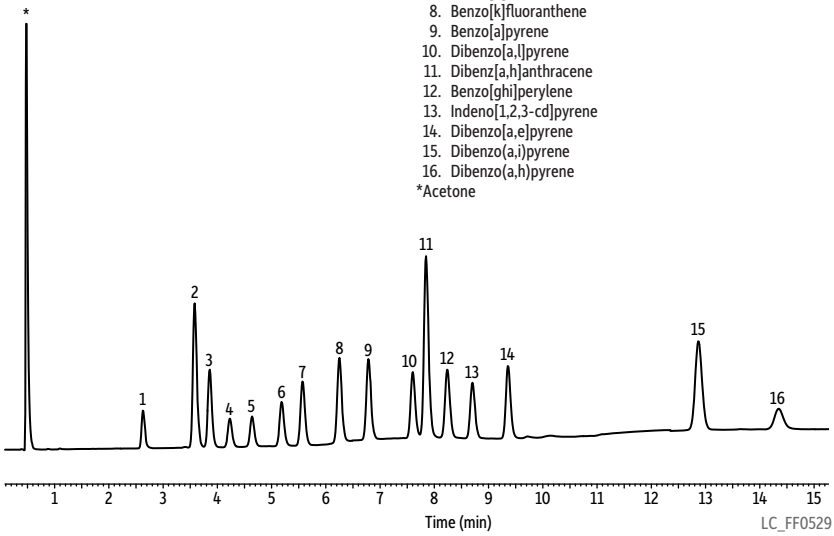
Mobile Phase	
A:	Water
B:	Acetonitrile

Time (min.)	%B
0	65
1	75
2	100
4.2	100
4.21	65
4.7	65

Flow:	0.8 mL/min.
Max Pressure:	725 bar
Detector	PDA @ 254, 4.8 nm
Instrument	Waters

EU 15+1 PAHs on Pinnacle® II PAH (UV/Vis)

NEW!



LC_FF0529

Peaks
1. Benzo[c]fluorene
2. Cyclopenta[cd]pyrene
3. Benzo[a]anthracene
4. Chrysene
5. 5-Methylchrysene
6. Benzo(j)fluoranthene
7. Benzo[b]fluoranthene
8. Benzo[k]fluoranthene
9. Benzo[a]pyrene
10. Dibenzo[a,l]pyrene
11. Dibenz[a,h]anthracene
12. Benzo[ghi]perylene
13. Indeno[1,2,3-cd]pyrene
14. Dibenzo[a,e]pyrene
15. Dibenzo(a,i)pyrene
16. Dibenzo(a,h)pyrene

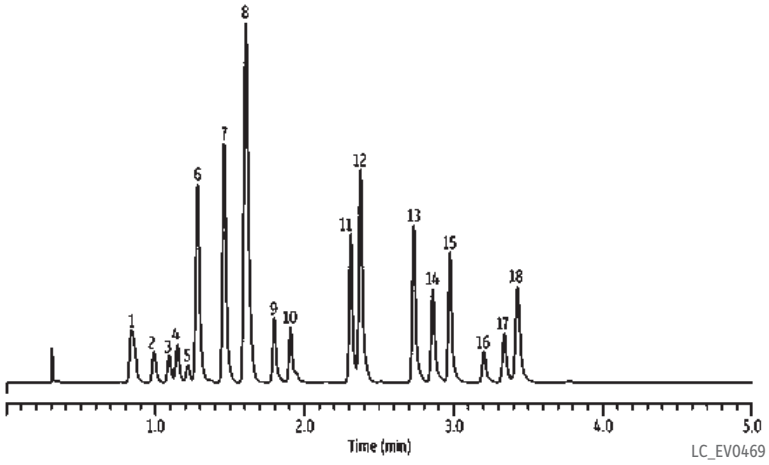
*Acetone

Column	Pinnacle® II PAH (cat.# 921946E)
Dimensions:	150 mm x 3.0 mm ID
Particle Size:	4.0 µm
Pore Size:	110 Å
Temp.:	30 °C
Sample	custom EU 15+1 PAH Mix
Diluent:	acetonitrile
Conc.:	10 µg/mL (ppm)
Inj. Vol.:	5 µL
Mobile Phase	
A:	water
B:	acetonitrile:tetrahydrofuran (95:5)

Time (min)	Flow (mL/min)	%A	%B
0	1.5	30	70
3.00	1.5	25	75
10.00	1.5	0	100
14.50	1.5	0	100
14.51	1.5	30	70
16.5	1.5	30	70

Max Pressure:	275 bar
Detector	UV/Vis @ 292, 4 nm
Cell Temp:	40 °C
Flow Cell Size:	10 µL
Instrument	Shimadzu Prominence

EPA Method 610 Polycyclic Aromatic Hydrocarbons on Pinnacle® DB PAH



LC_EV0469

Peaks
1. Naphthalene
2. Acenaphthylene
3. 1-Methylnaphthalene
4. 2-Methylnaphthalene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benzo[a]anthracene
12. Chrysene
13. Benzo[b]fluoranthene
14. Benzo[k]fluoranthene
15. Benzo[a]pyrene
16. Dibenzo[a,h]anthracene
17. Benzo[ghi]perylene
18. Indeno[1,2,3-cd]pyrene

Column	Pinnacle® DB PAH (cat.# 9470252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	30 °C
Sample	
Diluent:	acetonitrile
Conc.:	20 µg/mL each component
Inj. Vol.:	2 µL

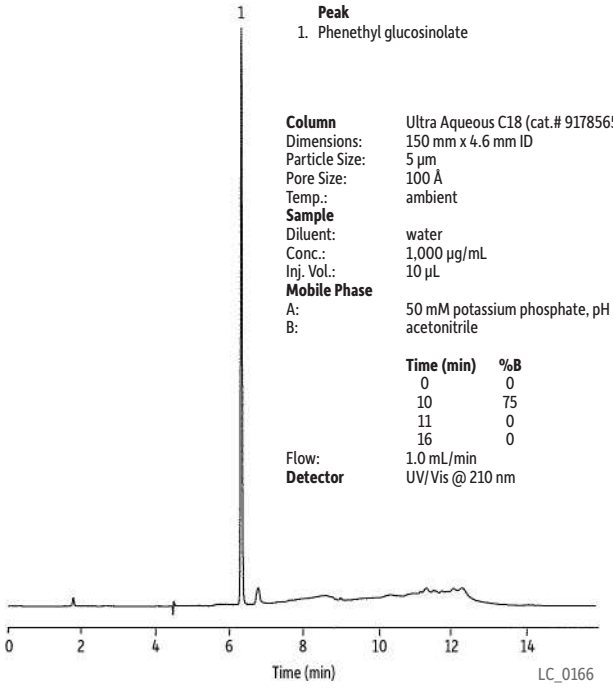
Mobile Phase	
A:	water
B:	acetonitrile

Time (min)	**%B**
0	50
1	60
3	100
5	100

Flow:	0.6 mL/min
Detector	UV/Vis @ 254 nm
Instrument	Jasco X-LC

For more PAH chromatograms, visit www.restek.com/chromatograms

Phenethyl Glucosinolate on Ultra Aqueous C18



Peak	
1. Phenethyl glucosinolate	

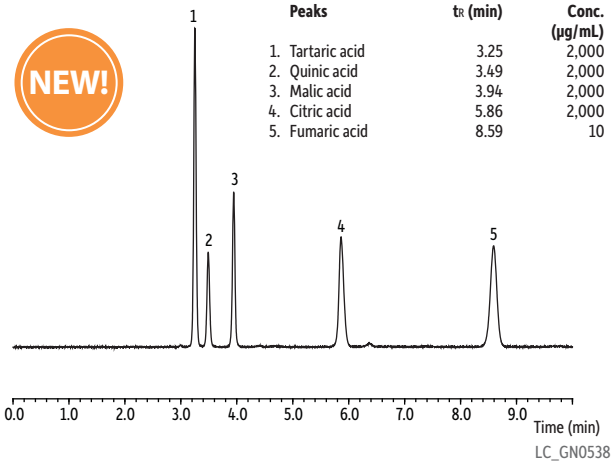
Column	Ultra Aqueous C18 (cat.# 9178565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	water
Conc.:	1,000 µg/mL
Inj. Vol.:	10 µL
Mobile Phase	
A:	50 mM potassium phosphate, pH 2.5
B:	acetonitrile

Time (min)	%B
0	0
10	75
11	0
16	0

Flow:	1.0 mL/min
Detector	UV/Vis @ 210 nm

Organic Acids on Ultra Aqueous C18

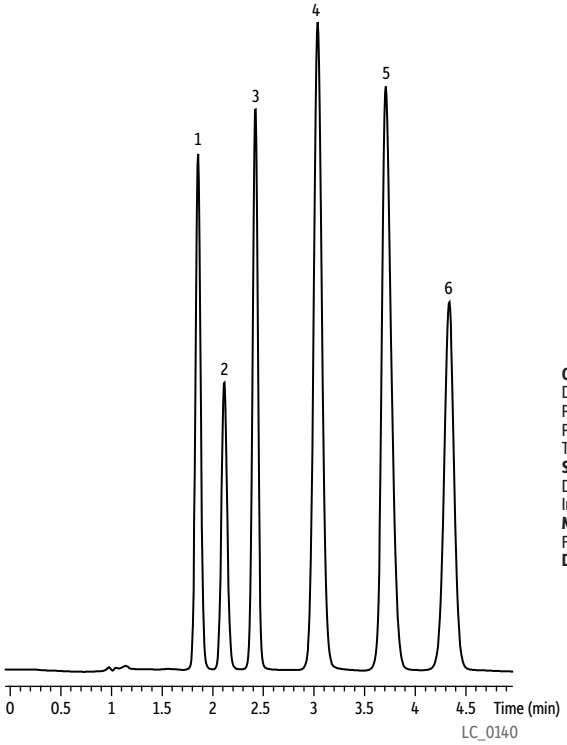
NEW!



Peaks	t_R (min)	Conc. (µg/mL)
1. Tartaric acid	3.25	2,000
2. Quinic acid	3.49	2,000
3. Malic acid	3.94	2,000
4. Citric acid	5.86	2,000
5. Fumaric acid	8.59	10

Column	Ultra Aqueous C18 (cat.# 9178575)
Dimensions:	250 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	50 °C
Sample	Fruit juice organic acid standard (cat.# 35080)
Diluent:	Water
Inj. Vol.:	5 µL
Mobile Phase	0.1% phosphoric acid in water
Flow:	1.0 mL/min
Detector	UV/Vis @ 214 nm
Instrument	Shimadzu UFLCXR

Carboxylic Acids on Ultra Aqueous C18

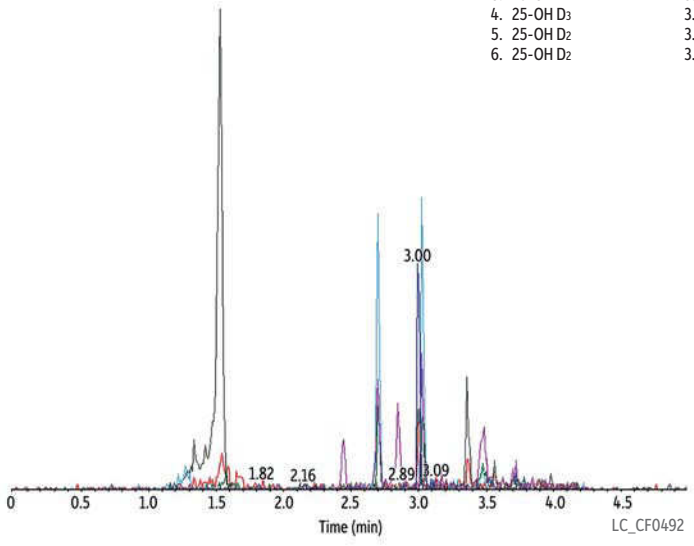


Peaks	Conc. (µg/mL)
1. Malonic acid	500
2. Lactic acid	500
3. Acetic acid	1,000
4. Citric Acid	1,000
5. Succinic acid	2,000
6. Fumaric acid	10

Column	Ultra Aqueous C18 (cat.# 9178565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	25 °C
Sample	
Diluent:	water
Inj. Vol.:	10 µL
Mobile Phase	50 mM potassium phosphate, pH 2.5:acetonitrile (99:1)
Flow:	1.5 mL/min
Detector	UV/Vis @ 210 nm

Vitamin D on Ultra Aqueous C18

Peaks	t_R (min)	Q1	Q3	Declustering potential (V)
1. d6-25-OH D_3 (IS)	3.00	389.3	211.2	68
2. 25-OH D_3	3.00	383.3	211.2	68
3. 25-OH D_2	3.04	395.3	229.2	55
4. 25-OH D_3	3.00	383.3	229.2	68
5. 25-OH D_2	3.04	395.3	269.2	55
6. 25-OH D_2	3.04	395.3	119.0	55

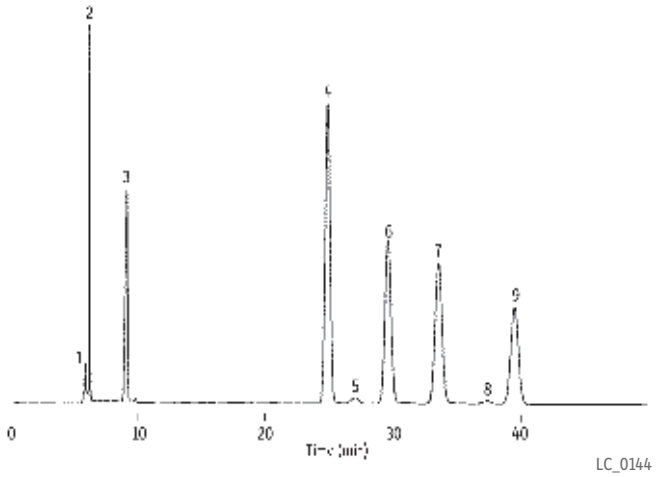


Column	Ultra Aqueous C18 (cat.# 9178352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	40 °C
Sample	extracted serum sample
Inj. Vol.:	20 µL
Mobile Phase	
A:	0.1% formic acid in water
B:	0.1% formic acid in methanol

Time (min)	%B
0	50
2.5	100
3.5	100
3.6	50
5.0	50

Flow:	0.7 mL/min
Detector	Applied Biosystems 3200 QTRAP™ LC-MS/MS system
Ion Source:	TurboIonSpray®
Ion Source:	APCI
Ion Mode:	APCI+
Mode:	MRM
Dwell Time:	100 ms
Instrument	Shimadzu UFLC$_{XR}$

Vitamins (Fat Soluble) on Ultra C18



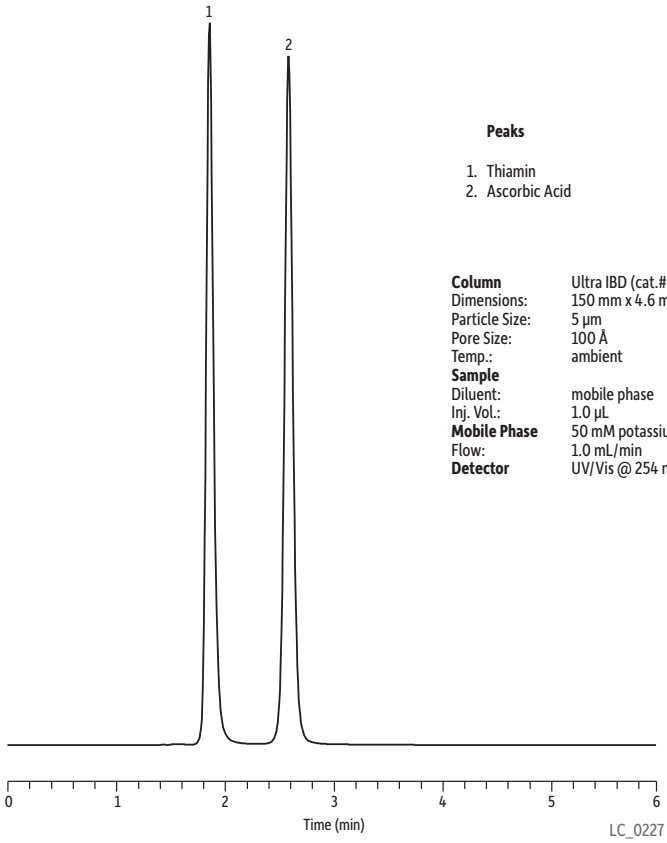
Peaks	Conc. (mg/mL)
1. solvent front	n/a
2. Menadione (Vitamin K3)	0.45
3. All-*trans*-Retinol (Vitamin A)	0.34
4. Vitamin D3	0.4
5. unknown	n/a
6. α-Tocopherol (Vitamin E)	2.4
7. α-Tocopherol Acetate (Vitamin E Acetate)	2.4
8. unknown	n/a
9. Phylloquinone (Vitamin K1)	0.84

Column	Ultra C18 (cat.# 9174575)
Dimensions:	250 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	diethyl ether
Mobile Phase	
A:	acetonitrile:methanol (90:10, v/v)

Time (min)	Flow (mL/min)
1.00	1.00
5.00	1.00
5.01	2.00
50.0	2.00

Detector	UV/Vis @ 280 nm

Vitamins Thiamin (Vitamin B1) and Ascorbic Acid (Vitamin C) on Ultra IBD



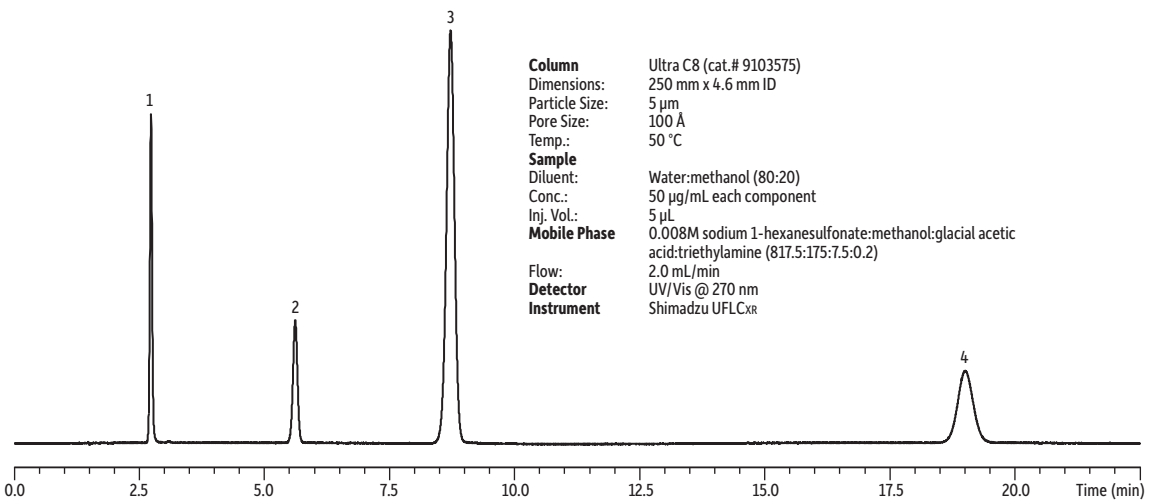
Peaks	Conc. (mg/mL)
1. Thiamin	2.5
2. Ascorbic Acid	2.5

Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	mobile phase
Inj. Vol.:	1.0 µL
Mobile Phase	50 mM potassium phosphate, pH 2.5
Flow:	1.0 mL/min
Detector	UV/Vis @ 254 nm

LC_0227

Vitamins B1, B2, B3, and B6 on Ultra C8

Peaks	t_R (min)
1. Vitamin B_3 (nicotinamide)	2.732
2. Vitamin B_6 (pyridoxine)	5.615
3. Vitamin B_2 (riboflavin)	8.719
4. Vitamin B_1 (thiamine)	19.004

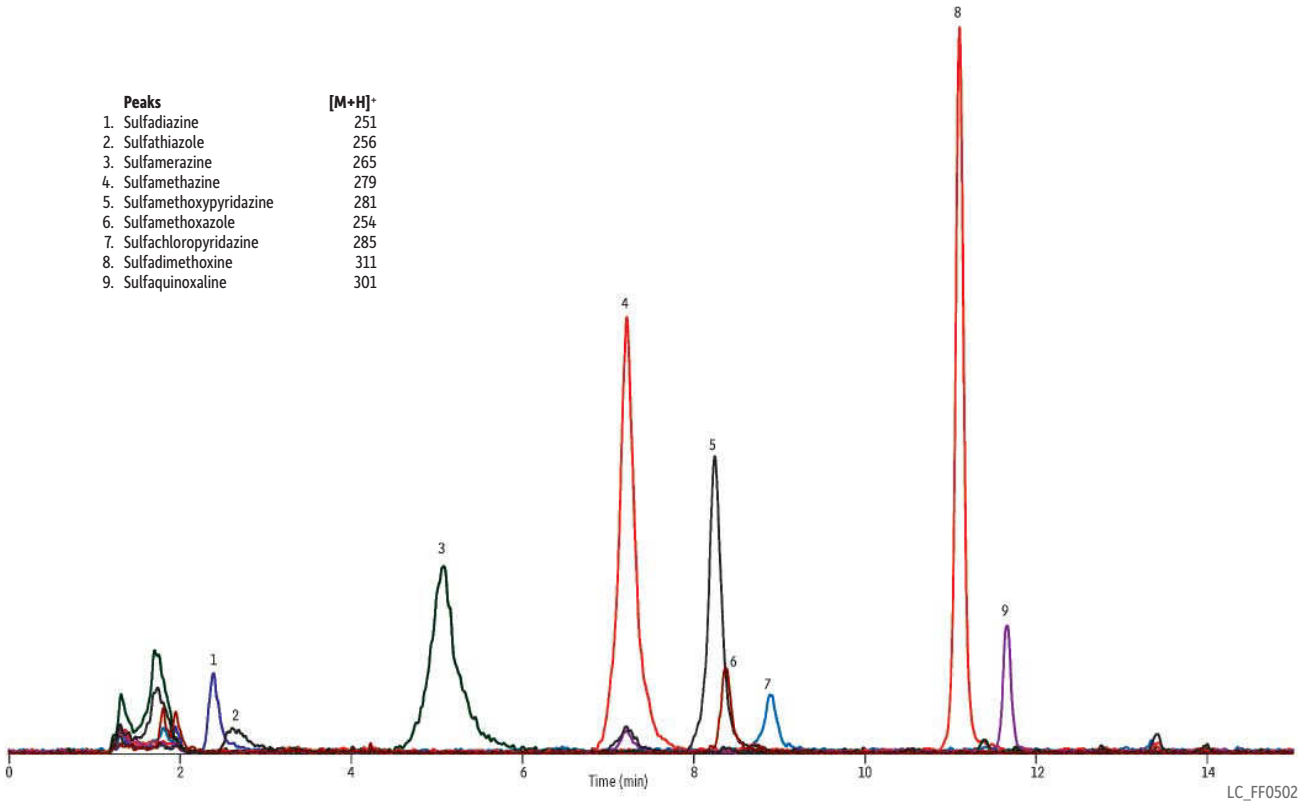


Column	Ultra C8 (cat.# 9103575)
Dimensions:	250 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	50 °C
Sample	
Diluent:	Water:methanol (80:20)
Conc.:	50 µg/mL each component
Inj. Vol.:	5 µL
Mobile Phase	0.008M sodium 1-hexanesulfonate:methanol:glacial acetic acid:triethylamine (817.5:175:7.5:0.2)
Flow:	2.0 mL/min
Detector	UV/Vis @ 270 nm
Instrument	Shimadzu UFLC$_{XR}$

LC_PH0497

Sulfonamides in Milk on Pinnacle® DB Biphenyl

Peaks	[M+H]+
1. Sulfadiazine	251
2. Sulfathiazole	256
3. Sulfamerazine	265
4. Sulfamethazine	279
5. Sulfamethoxypyridazine	281
6. Sulfamethoxazole	254
7. Sulfachloropyridazine	285
8. Sulfadimethoxine	311
9. Sulfaquinoxaline	301



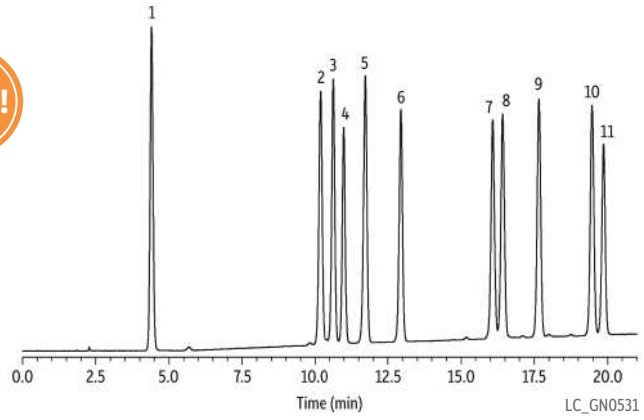
LC_FF0502

Column	Pinnacle® DB Biphenyl (cat.# 9409312)
Dimensions:	100 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	140 Å
Temp.:	ambient
Sample	milk spiked with 200 ppb sulfonamides (see notes)
Diluent:	0.2% formic acid
Conc.:	4 µg/mL
Inj. Vol.:	10 µL
Mobile Phase	
A:	0.2% formic acid
B:	methanol:acetonitrile (80:20) with 0.2% formic acid

Time (min)	%B
0	15
20	100
30	100

Flow:	0.2 mL/min
Detector	LECO Unique® TOFMS
Run Length:	20 min
Ionization Source Type:	ESI
Ion Mode:	positive
Mass Range:	200-1,000 amu
Desolvation Gas (N_2):	4 L/min
Interface Temp.:	120 °C
Nozzle Voltage:	50 V
Capillary Voltage:	3.8 kV
Instrument	LECO
Notes	SAMPLE: milk spiked at 200 ppb with sulfonamides, extracted with Q-sep™ QuEChERS extraction tube, and cleaned up with Q-sep™ QuEChERS dSPE clean-up tube (cat.# 26216), then concentrated. FLOW: 1 mL/min with preinjection split delivering 0.2 mL/min to column

Sulfur Antibiotics on Ultra Biphenyl



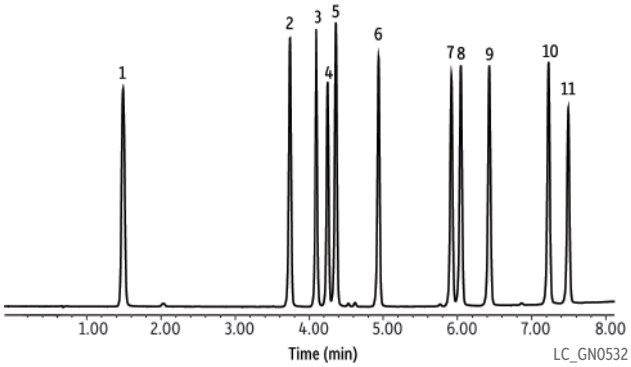
	Peaks	t_R (min)
1.	Sulfanilamide	4.40
2.	Sulfadiazine	10.18
3.	Sulfapyridine	10.63
4.	Sulfathiazole	10.99
5.	Sulfamerazine	11.72
6.	Sulfamethazine	12.94
7.	Sulfachlorpyridazine	16.08
8.	Sulfadoxine	16.42
9.	Sulfisoxazole	17.65
10.	Sulfadimethoxine	19.47
11.	Sulfaquinoxaline	19.86

Column Ultra Biphenyl (cat.# 9109565)
Dimensions: 150 mm x 4.6 mm ID
Particle Size: 5 µm
Pore Size: 100 Å
Temp.: 25 °C
Sample
Diluent: 0.1% formic acid in water
Conc.: 50 µg/mL
Inj. Vol.: 10 µL
Mobile Phase
A: 0.1% formic acid in water
B: 0.1% formic acid in acetonitrile

Time (min)	%A	%B
0	90	10
3.0	90	10
20.0	60	40
21.0	60	40

Flow: 1.0 mL/min
Detector UV/Vis @ 265
Instrument Shimadzu UFLCXR

Sulfur Antibiotics by UHPLC on Pinnacle® DB Biphenyl



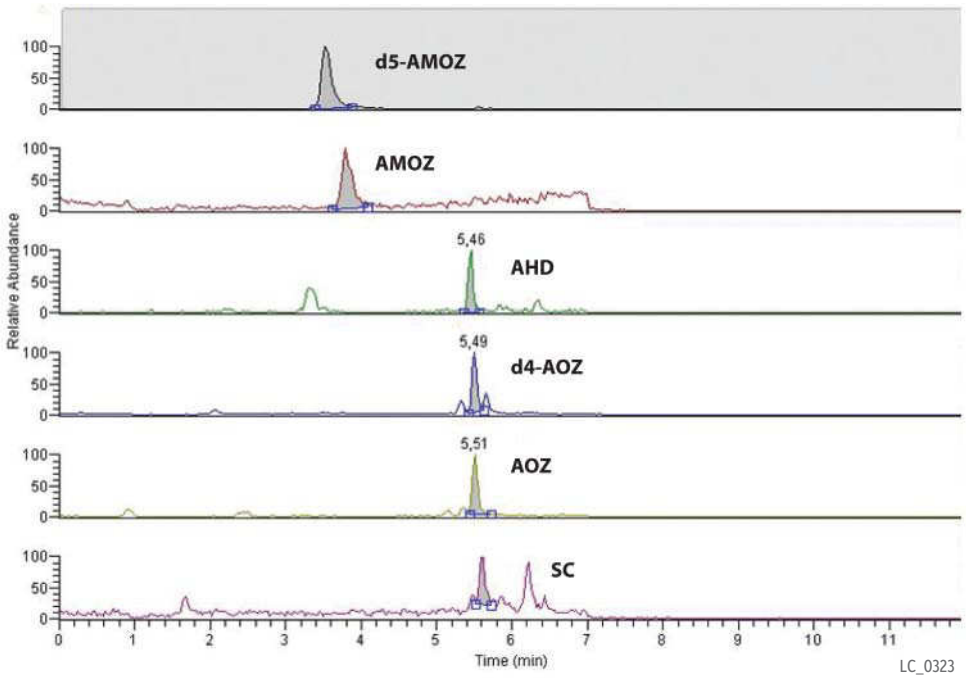
	Peaks	t_R (min)
1.	Sulfanilamide	1.55
2.	Sulfadiazine	3.74
3.	Sulfapyridine	4.09
4.	Sulfathiazole	4.24
5.	Sulfamerazine	4.35
6.	Sulfamethazine	4.91
7.	Sulfachlorpyridazine	5.87
8.	Sulfadoxine	5.99
9.	Sulfisoxazole	6.37
10.	Sulfadimethoxine	7.14
11.	Sulfaquinoxaline	7.40

Column Pinnacle® DB Biphenyl (cat.# 9409212)
Dimensions: 100 mm x 2.1 mm ID
Particle Size: 1.9 µm
Pore Size: 140 Å
Temp.: 25 °C
Sample
Diluent: 0.1% formic acid in water
Conc.: 50 µg/mL
Inj. Vol.: 2 µL
Mobile Phase
A: 0.1% formic acid in water
B: 0.1% formic acid in acetonitrile

Time (min)	%A	%B
0	95	5
8	60	40

Flow: 0.4 mL/min
Detector UV/Vis @ 265 nm
Instrument Shimadzu UFLCXR

Nitrofuran Metabolites by LC-MS/MS on Ultra C18 Column



Column Ultra C18 (cat.# 9174312)
Dimensions: 100 mm x 2.1 mm ID
Particle Size: 3 µm
Pore Size: 100 Å
Temp.: 30 °C
Sample
Conc.: 0.3 ppb each analyte
Mobile Phase
A: 0.05% formic acid in methanol
B: 0.05% formic acid – 5 mM NH_4 formate in water

Time (min)	%B
0	90
2.5	90
5	10
10	10
12	90
15	90

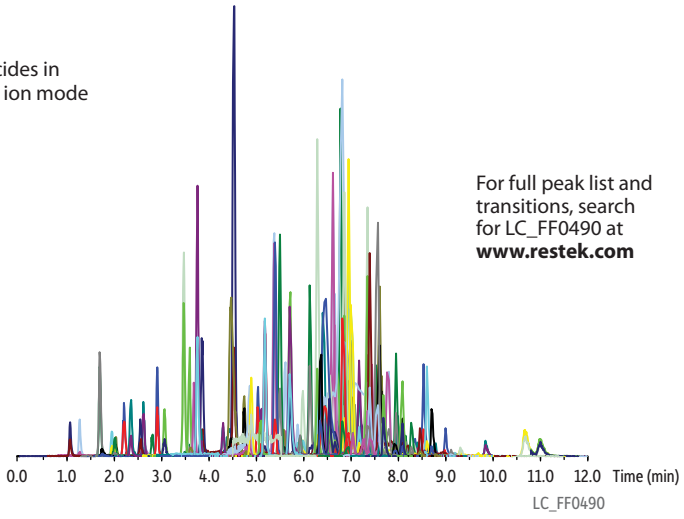
Flow: 0.2 mL/min
Detector MS/MS triple quadrupole (Thermo Scientific Discovery)
Ion Source: Electrospray
Ion Mode: ESI+
Notes **Analyzer Parameters:**
Only segment: 15 min
Data type: centroid
Scan mode: SRM product
Scan width (m/z): 0.7
Scan time (s): 0.25
Peak width: Q1: within 0.7; Q2: 0.7
Collision gas pressure (mTorr): 1.5 (argon)
Divert valve: active, with 3 positions
Positions: 1° 2 min, 2° 8 min, 3° 5 min

Peaks	t_R (min)	Prec. Ion	Prod. Ion	Collision E (V)	Tube Lens
1. d5-AMOZ	3.7	—	—	—	—
2. AMOZ	3.8	335	291	10	100
3. AHD	5.46	249	134	12	110
4. d4-AOZ	5.49	—	—	—	—
5. AOZ	5.51	236	134	12	120
6. SC	5.6	209	166	12	80

AMOZ = 3-amino-5-morpholinomethyl-2-oxazolidinone; AHD = 1-aminohydantoin hydrochloride; AOZ = 3-amino-2-oxazolidinone; SC = semicarbazide

Pesticides on Ultra Aqueous C18 (LC-MS/MS)

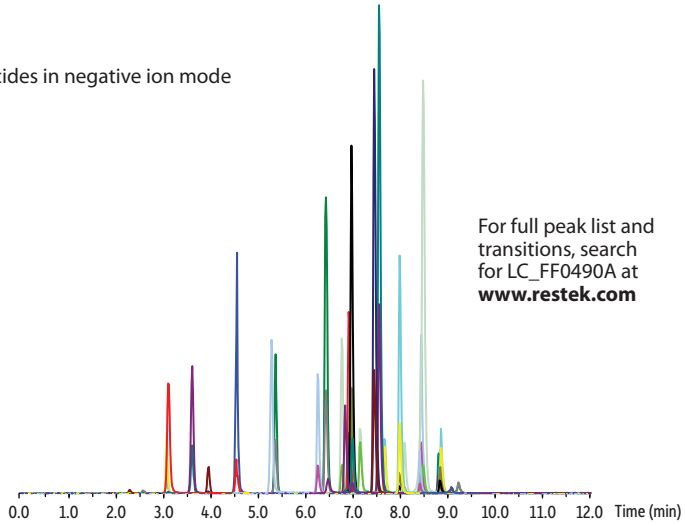
A: Pesticides in positive ion mode



LC_FF0490

For full peak list and transitions, search for LC_FF0490 at **www.restek.com**

B: Pesticides in negative ion mode



LC_FF0490A

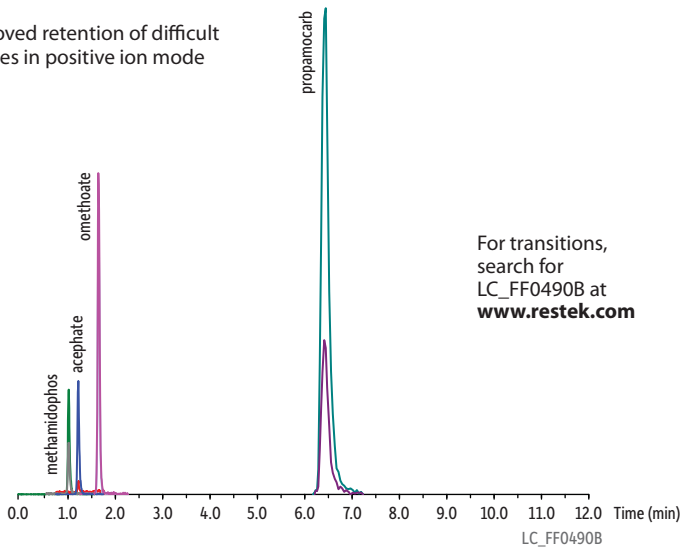
For full peak list and transitions, search for LC_FF0490A at **www.restek.com**

Column	Ultra Aqueous C18 (cat.# 9178312)
Dimensions:	100 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	35 °C
Sample	multicomponent pesticide standard
Diluent:	water
Conc.:	1 ppb each pesticide
Inj. Vol.:	10 µL
Mobile Phase	
A:	10 mM NH_4OAc in water
B:	10 mM NH_4OAc in methanol

Time (min)	**%B**
0	20
8.0	90
12.0	100
14.8	100
14.9	20

Flow:	0.5 mL/min
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	4000 QTRAP®
Ion Source:	TurboIonSpray®
Ion Mode:	A & C: ESI+ B: ESI-
Ion Spray Voltage:	5 kV (ESI+), -4.2kV (ESI-)
Gas 1:	50 psi (344.7 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	600 °C
Instrument	Shimadzu UFLCXR

C: Improved retention of difficult pesticides in positive ion mode

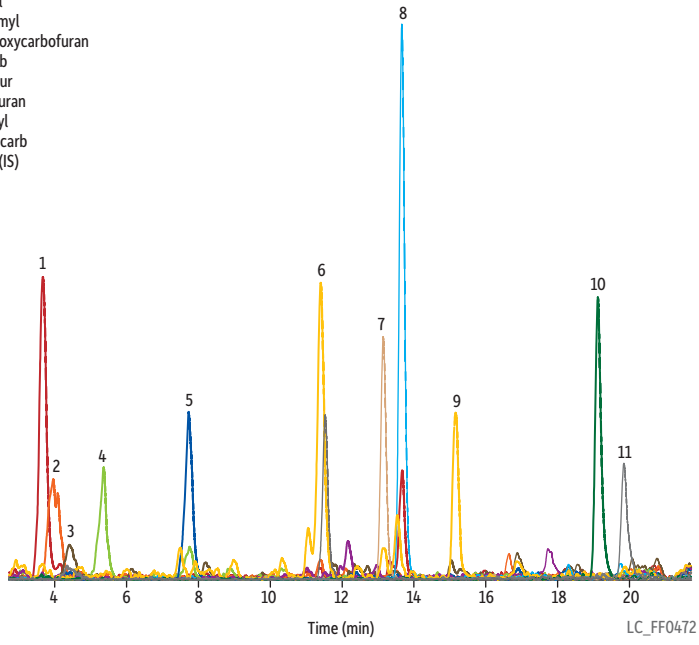


LC_FF0490B

For transitions, search for LC_FF0490B at **www.restek.com**

Carbamates in Orange Oil on Ultra Carbamate

Peaks
1. Aldicarb sulfone
2. Aldicarb sulfoxide
3. Oxamyl
4. Methomyl
5. 3-Hydroxycarbofuran
6. Aldicarb
7. Propoxur
8. Carbofuran
9. Carbaryl
10. Methiocarb
11. BDMC (IS)



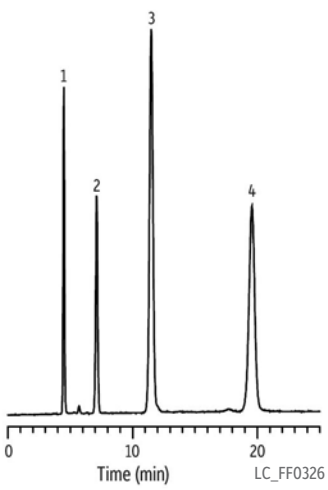
Column	Ultra Carbamate (cat.# 9177352)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	3 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	531.1 Carbamate Pesticide Calibration Mixture (cat.# 32273) 4-bromo-3,5-dimethylphenyl-N-methylcarbamate (BDMC) (cat.# 32274)
Diluent:	methanol
Conc.:	10 ppm spiked into unprocessed orange oil
Inj. Vol.:	3 µL
Mobile Phase	
A:	2 mM ammonium acetate:methanol, 90:10
B:	2 mM ammonium acetate:methanol, 10:90

Time (min)	**%B**
0	20
20	100
25	100

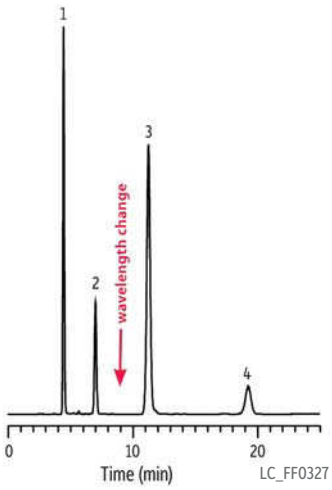
Flow:	0.2 mL/min
Detector	LECO Unique® TOFMS
Ionization Source Type:	high flow ESI
Ion Mode:	positive
Nebulizing Pressure:	100 kPa
Desolvation Gas (N_2):	4 L/min
Interface Temp.:	120 °C
Nozzle Voltage:	62 V
Capillary Voltage:	2.75 kV

Sudan Dyes on Ultra Aqueous C18

Photodiode Array Detector



Fixed Dual Wavelength Detector



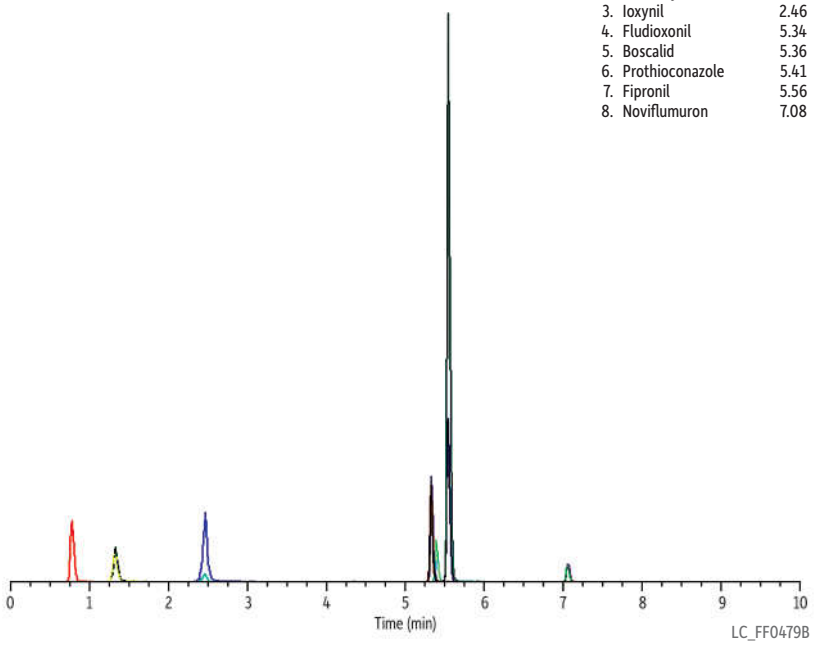
Monitor Sudan I, II, III, and IV in a single, isocratic analysis!

Peaks
1. Sudan I
2. Sudan II
3. Sudan III
4. Sudan IV

Column	Ultra Aqueous C18 (cat.# 9178565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	mixture of Sudan I, Sudan II, Sudan III, Sudan IV
Diluent:	methanol
Conc.:	20 µg/mL each
Inj. Vol.:	20 µL
Mobile Phase	water:methanol (3:97)
Flow:	1.0 mL/min
Detector	UV/Vis
Notes	Detector: 476/493/512/357 nm (photodiode array), 488/520 nm (fixed dual wavelength)

Pesticides on Pinnacle® DB Aqueous C18 (LC-MS/MS, ESI-)

Peaks	t_R (min)	Polarity	Mol. Wt.	Transition 1
1. Bentazone	0.77	negative	240.28	239.0→131.8
2. Bromoxynil	1.32	negative	276.91	275.9→80.8
3. Ioxynil	2.46	negative	370.92	369.8→126.7
4. Fludioxonil	5.34	negative	248.19	247.0→179.9
5. Boscalid	5.36	negative	343.21	343.0→307.0
6. Prothioconazole	5.41	negative	344.26	341.9→305.8
7. Fipronil	5.56	negative	437.15	434.9→329.8
8. Noviflumuron	7.08	negative	529.1	527.1→343.8



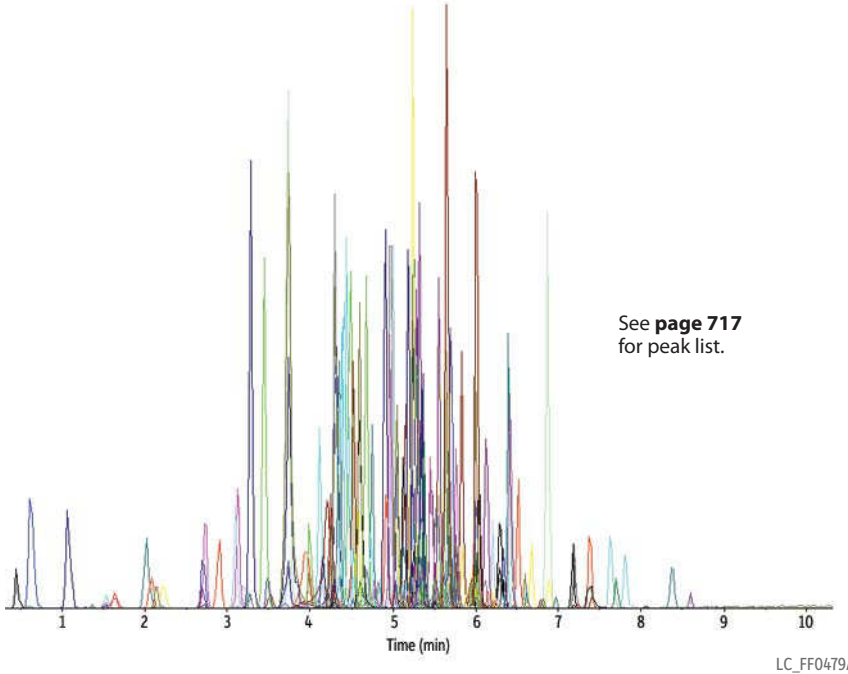
LC_FF0479B

Column	Pinnacle® DB Aqueous C18 (cat.# 9418252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	35 °C
Sample	multicomponent pesticide standard
Diluent:	water
Conc.:	33.3 ppb each pesticide
Inj. Vol.:	5 µL
Mobile Phase	
A:	10 mM NH_4OAc in water
B:	10 mM NH_4OAc in methanol

Time (min)	%B
0	10
1	10
8	90
10	90
11	10

Flow:	0.60 mL/min
Max Pressure:	~517 bar
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	4000 QTRAP® LC-MS/MS system
Ion Source:	TurboIonSpray®
Ion Mode:	ESI-
Ion Spray Voltage:	-4.2 kV
Gas 1:	40 psi (275.8 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	500 °C
Instrument	Shimadzu UFLC$_{XR}$

Pesticides on Pinnacle® DB Aqueous C18 (LC-MS/MS, ESI+)



LC_FF0479A

See **page 717** for peak list.

Column	Pinnacle® DB Aqueous C18 (cat.# 9418252)
Dimensions:	50 mm x 2.1 mm ID
Particle Size:	1.9 µm
Pore Size:	140 Å
Temp.:	35 °C
Sample	multicomponent pesticide standard
Diluent:	water
Conc.:	33.3 ppb each pesticide
Inj. Vol.:	5 µL
Mobile Phase	
A:	10 mM NH_4OAc in water
B:	10 mM NH_4OAc in methanol

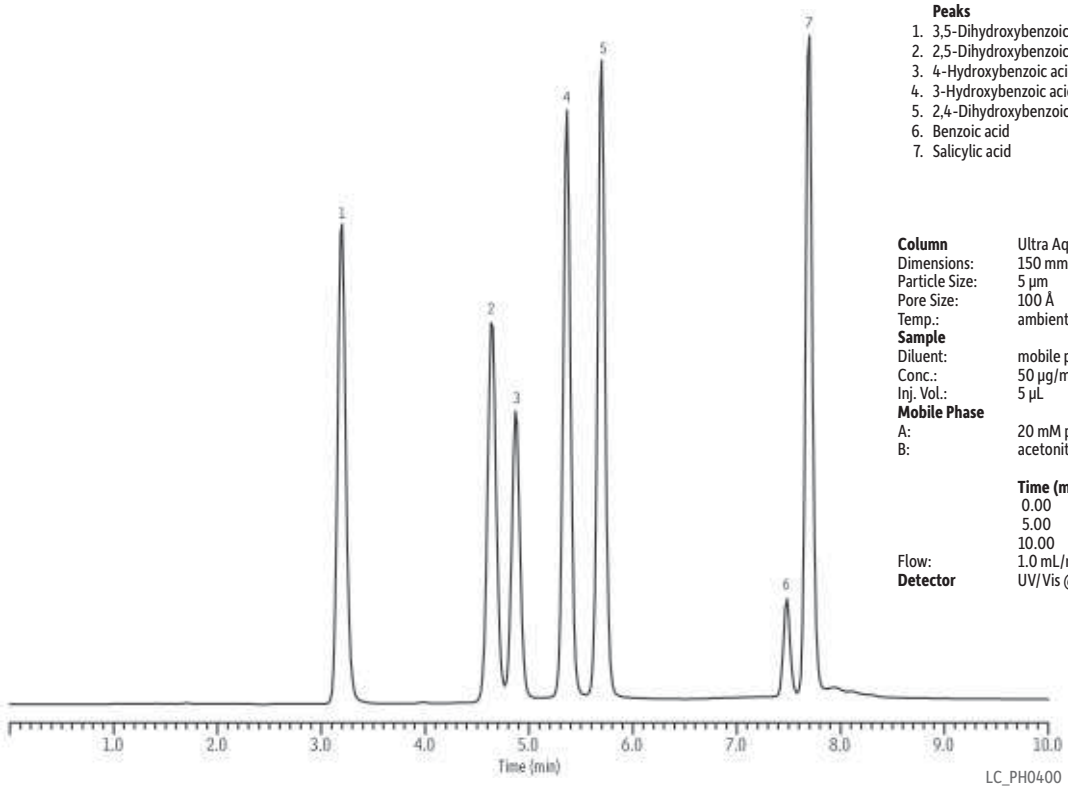
Time (min)	%B
0	10
1	10
8	90
10	90
11	10

Flow:	0.60 mL/min
Max Pressure:	~517 bar
Detector	Applied Biosystems/MDS Sciex LC-MS/MS
Model #:	4000 QTRAP® LC-MS/MS system
Ion Source:	TurboIonSpray®
Ion Spray Voltage:	5 kV
Gas 1:	40 psi (275.8 kPa)
Gas 2:	60 psi (413.7 kPa)
Source Temp.:	500 °C
Instrument	Shimadzu UFLC$_{XR}$

Transitions for Pesticides on Pinnacle® DB Aqueous C18 (LC-MS/MS, ESI+), previous page

	Peaks	t_R (min)	Polarity	Mol. Wt.	Transition 1
1.	Methamidophos	0.45	positive	141.13	142.0→94.0
2.	Acephate	0.62	positive	183.17	184.0→142.8
3.	Bentazone	0.77	negative	240.28	239.0→131.8
4.	Omethoate	1.07	positive	213.14	214.0→124.9
5.	Bromoxynil	1.32	negative	276.91	275.9→80.8
6.	Butoxycarboxin	1.64	positive	222.27	223.1→86.1
7.	Aldicarb sulfoxide	2.03	positive	206.26	207.1→132.1
8.	Methomyl	2.08	positive	162.21	163.1→88.1
9.	Ioxynil	2.46	negative	370.92	369.8→126.7
10.	Thiamethoxam	2.7	positive	291.7	292.0→211.0
11.	Monocrotophos	2.73	positive	223.17	224.1→127.0
12.	Dimethoate	2.9	positive	229.26	230.1→199.0
13.	Fenuron	3.1	positive	164.21	165.1→72.1
14.	Dioxacarb	3.12	positive	223.23	224.0→123.0
15.	Dicrotophos	3.28	positive	237.19	238.0→112.0
16.	Vamidothion	3.45	positive	287.34	288.0→146.0
17.	Carbendazim	3.73	positive	191.19	192.0→160.0
18.	Aldicarb	3.73	positive	190.27	208.1→116.0
19.	Formetanate	3.74	positive	221.26	222.1→165.2
20.	Acetamiprid	3.95	positive	222.67	223.1→126.1
21.	Carbetamide	3.99	positive	236.27	237.0→192.0
22.	Oxamyl	3.99	positive	219.26	237.1→72.2
23.	Aminocarb	4.11, 4.44	positive	208.26	209.2→137.1
24.	Propoxur	4.15	positive	209.24	210.1→111.0
25.	Oxadixyl	4.21	positive	278.31	279.0→219.0
26.	Bendiocarb	4.24	positive	223.23	224.1→109.1
27.	Thiacloprid	4.25	positive	252.71	253.2→126.1
28.	Thiophanate methyl	4.3	positive	342.4	343.0→151.0
29.	Methabenzthiazuron	4.31	positive	221.28	222.0→165.1
30.	Tricyclazole	4.35	positive	189.23	190.0→163.0
31.	Pyracarbolid	4.38	positive	217.27	218.2→125.0
32.	Propamocarb	4.41	positive	188.27	189.2→102.2
33.	Carboxin	4.51	positive	235.3	236.0→143.0
34.	Ethiofencarb	4.52	positive	225.31	226.1→106.9
35.	Carbaryl	4.58	positive	201.22	202.1→145.1
36.	Thiabendazole	4.6	positive	201.25	202.0→175.0
37.	Carbanilide	4.6	positive	212.25	213.1→94.0
38.	Clethodim	4.61	positive	359.91	360.0→164.0
39.	Tebuthiuron	4.68	positive	228.32	229.2→172.4
40.	Fluometuron	4.75	positive	232.21	233.1→72.0
41.	Metobromuron	4.82	positive	259.1	259.0→170.2
42.	Flutriafol	4.84	positive	301.3	302.0→123.0
43.	Chlortoluron	4.92	positive	212.68	213.1→72.2
44.	Simetryn	4.96	positive	213.31	214.0→124.0
45.	Pirimicarb	4.97	positive	238.29	239.2→72.1
46.	Forchlorfenuron	5.04	positive	247.68	248.0→129.1
47.	Siduron	5.09	positive	232.32	233.3→137.2
48.	Ethofumesate	5.11	positive	286.35	304.0→121.0
49.	Cycluron	5.13	positive	198.31	199.1→89.1
50.	Diuron	5.13	positive	233.1	233.1→72.0
51.	Diethofencarb	5.15	positive	267.33	268.0→226.0
52.	Furalaxyl	5.18	positive	301.34	302.2→95.0
53.	Methiocarb	5.24	positive	225.31	226.1→169.2
54.	Secbumeton	5.24	positive	225.29	226.2→169.9
55.	Terbumeton	5.25	positive	225.29	226.2→169.9
56.	Prometon	5.26	positive	225.29	226.2→142.3
57.	Paclobutrazol	5.26	positive	293.8	294.0→70.0
58.	Promecarb	5.27	positive	207.27	208.2→109.2
59.	Dimoxystrobin	5.27	positive	326.39	327.1→205.0
60.	Ametryn	5.29	positive	227.33	228.2→186.2
61.	Methoprotryne	5.32	positive	271.39	272.2→240.2
62.	Triadimefon	5.32	positive	293.75	294.0→197.0
63.	Mexacarbate	5.34	positive	222.28	223.2→166.2
64.	Fludioxonil	5.34	negative	248.19	247.0→179.9
65.	Boscalid	5.36	negative	343.21	343.0→307.0
66.	Azoxystrobin	5.36	positive	403.3	404.1→372.1
67.	Methoxyfenozide	5.38	positive	368.47	369.0→149.0
68.	Cyproconazole	5.39	positive	291.78	292.2→70.2
69.	Prothioconazole	5.41	negative	344.26	341.9→305.8
70.	Flufenacet	5.46	positive	363.34	364.0→152.0
71.	Butafenacil	5.47	positive	474.82	492.2→331.1
72.	Myclobutanil	5.51	positive	288.78	289.0→70.0
73.	Dimethomorph	5.52,5.54	positive	387.86	388.0→301.0
74.	Bromuconazole 47	5.54	positive	377.06	378.0→159.0
75.	Prometryn	5.55	positive	241.36	242.2→158.1
76.	Fipronil	5.56	negative	437.15	434.9→329.8
77.	Triticonazole	5.58	positive	317.81	318.0→70.0
78.	Tetraconazole	5.6	positive	372.12	372.0→159.0
79.	Uniconazole	5.62	positive	291.78	292.2→70.2
80.	Fluoxastrobin	5.62	positive	458.83	459.2→427.2
81.	Cyazofamid	5.63	positive	324.78	325.0→108.0
82.	Terbutryn	5.65	positive	241.36	242.2→186.0
83.	Tebufenozide	5.65	positive	352.47	353.1→133.1
84.	Chloroxuron	5.67	positive	290.75	291.0→72.0
85.	Picoxystrobin	5.67	positive	367.25	368.0→145.0
86.	Carfentrazone ethyl	5.69	positive	412.17	412.0→346.0
87.	Diclobutrazol	5.71	positive	328.21	328.0→70.0
88.	Fenoxycarb	5.72	positive	301.34	302.0→88.1
89.	Diflubenzuron	5.72	positive	310.67	311.2→158.1
90.	Neburon	5.74	positive	275.18	275.0→88.0
91.	Flusilazole	5.76	positive	315.4	316.0→247.0
92.	Epoxiconazole	5.76	positive	329.76	330.0→121.0
93.	Fenbuconazole	5.76	positive	336.82	337.0→125.0
94.	Bupirimate	5.77	positive	316.41	317.0→166.0
95.	Zoxamide	5.77	positive	336.54	336.2→187.1
96.	Rotenone	5.79	positive	394.42	395.0→213.0
97.	Benalaxyl	5.83	positive	325.41	326.0→148.0
98.	Tebuconazole	5.84	positive	307.82	308.0→70.0
99.	Penconazole	5.93	positive	284.19	284.0→159.0
100.	Cyprodinil	5.96	positive	225.29	226.0→93.0
101.	Propiconazole	5.96	positive	342.22	342.0→159.0
102.	Alanycarb	5.98	positive	399.52	400.1→238.2
103.	Triflumuron	5.99	positive	358.68	359.1→156.1
104.	Thiobencarb	6	positive	257.78	258.1→125.0
105.	Pyraclostrobin	6	positive	387.83	388.0→194.0
106.	Benzoximate	6.01	positive	363.8	364.0→199.0
107.	Pinoxaden	6.01	positive	400.52	401.3→317.2
108.	Clofentezine	6.11	positive	303.15	303.0→138.0
109.	Trifloxystrobin	6.12	positive	408.38	409.2→186.0
110.	Prochloraz	6.21	positive	376.67	376.0→308.0
111.	Difenoconazole	6.29	positive	406.28	406.0→251.0
112.	Benfuracarb	6.29	positive	410.53	411.2→195.1
113.	Triflumizole	6.38	positive	345.75	346.1→278.1
114.	Buprofezin	6.4	positive	305.44	306.0→201.0
115.	Piperonyl butoxide	6.42	positive	338.45	356.2→177.2
116.	Pyriproxyfen	6.52	positive	321.28	322.0→96.0
117.	Propargite	6.68	positive	350.48	368.0→231.0
118.	Etoxazole	6.87	positive	359.42	360.1→141.0
119.	Amitraz	6.89	positive	293.41	294.2→163.3
120.	Noviflumuron	7.08	negative	529.1	527.1→343.8
121.	Pyridaben	7.18	positive	364.94	365.0→147.0
122.	Fenpyroximate	7.2	positive	421.5	422.0→366.0
123.	Fenpropimorph	7.38	positive	303.49	304.0→147.0
124.	Spiroxamine	7.63,7.81	positive	297.48	298.0→144.0
125.	Spinosyn A	8.37	positive	731.97	732.6→142.2

Hydroxybenzoic Acids on Ultra Aqueous C18



LC_PH0400

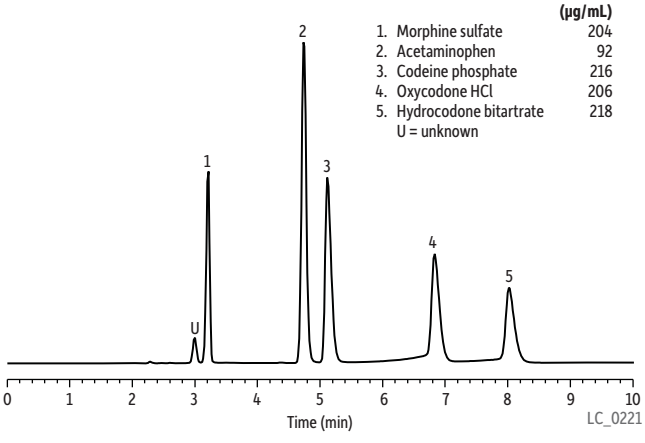
Peaks
1. 3,5-Dihydroxybenzoic acid
2. 2,5-Dihydroxybenzoic acid
3. 4-Hydroxybenzoic acid
4. 3-Hydroxybenzoic acid
5. 2,4-Dihydroxybenzoic acid
6. Benzoic acid
7. Salicylic acid

Column	Ultra Aqueous C18 (cat.# 9178565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	ambient
Sample	
Diluent:	mobile phase
Conc.:	50 µg/mL each component
Inj. Vol.:	5 µL
Mobile Phase	
A:	20 mM potassium phosphate (pH 2.5)
B:	acetonitrile

Time (min)	%B
0.00	20
5.00	50
10.00	50

Flow:	1.0 mL/min
Detector	UV/Vis @ 210 nm

Analgesic Acetaminophen and Narcotic Analgesics on Ultra C18

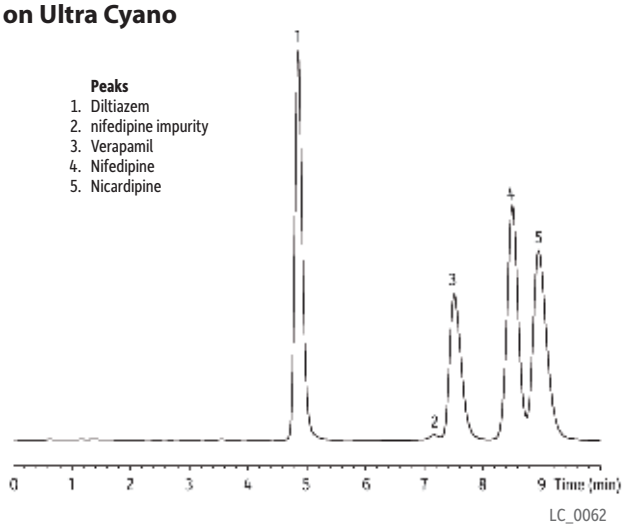


LC_0221

Peaks	Conc. (µg/mL)
1. Morphine sulfate	204
2. Acetaminophen	92
3. Codeine phosphate	216
4. Oxycodone HCl	206
5. Hydrocodone bitartrate	218
U = unknown	

Column	Ultra C18 (cat.# 9174575)
Dimensions:	250 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	35 °C
Sample	raw material mix
Diluent:	mobile phase
Inj. Vol.:	4.0 µL
Mobile Phase	10 mm potassium phosphate, pH 2.8:acetonitrile:methanol, (90:10, v/v) (85A:15B v/v)
Flow:	1.0 mL/min
Detector	UV/Vis @ 235 nm

Antiarrhythmic Calcium Channel Blockers on Ultra Cyano



LC_0062

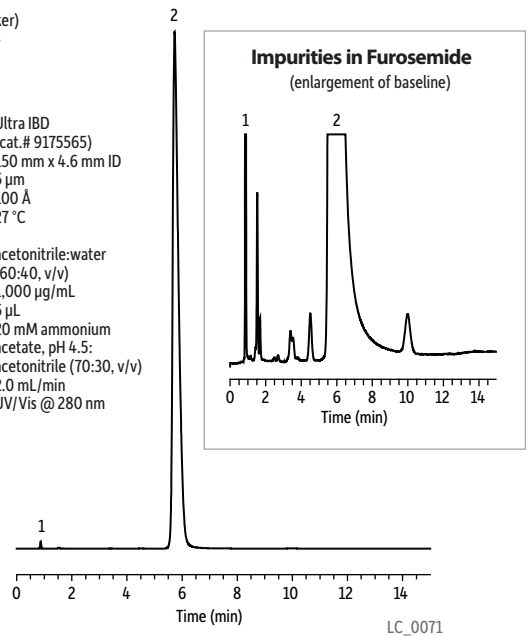
Peaks
1. Diltiazem
2. nifedipine impurity
3. Verapamil
4. Nifedipine
5. Nicardipine

Column	Ultra Cyano (cat.# 9106565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	acetonitrile:water (1:1)
Conc.:	100 mg/mL
Inj. Vol.:	5 µL
Mobile Phase	20 mM potassium phosphate monobasic, pH 3.0:acetonitrile (70:30, v/v)
Flow:	1.2 mL/min
Detector	UV/Vis @ 235 nm

Antiarrhythmic Furosemide on Ultra IBD

Peaks
1. uracil (marker)
2. Furosemide

Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	27 °C
Sample	
Diluent:	acetonitrile:water (60:40, v/v)
Conc.:	1,000 µg/mL
Inj. Vol.:	5 µL
Mobile Phase	20 mM ammonium acetate, pH 4.5: acetonitrile (70:30, v/v)
Flow:	2.0 mL/min
Detector	UV/Vis @ 280 nm

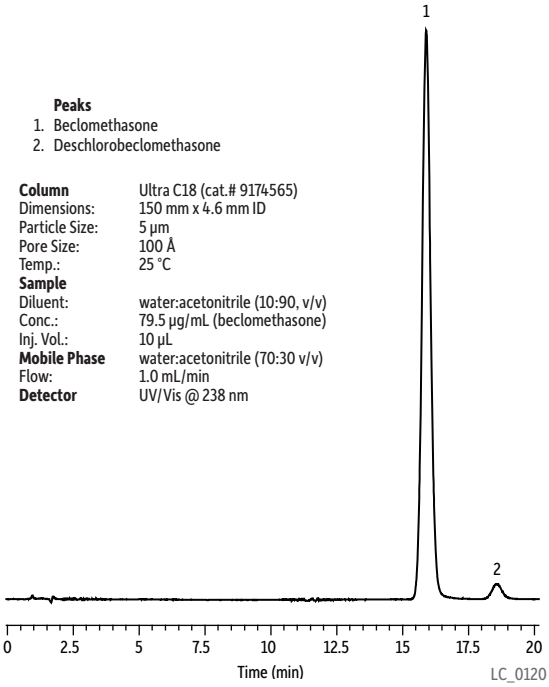


LC_0071

Antiasthmatic Beclomethasone on Ultra C18

Peaks
1. Beclomethasone
2. Deschlorobeclomethasone

Column	Ultra C18 (cat.# 9174565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	25 °C
Sample	
Diluent:	water:acetonitrile (10:90, v/v)
Conc.:	79.5 µg/mL (beclomethasone)
Inj. Vol.:	10 µL
Mobile Phase	water:acetonitrile (70:30 v/v)
Flow:	1.0 mL/min
Detector	UV/Vis @ 238 nm



LC_0120

Benzalkonium Chloride Compounds on Ultra IBD

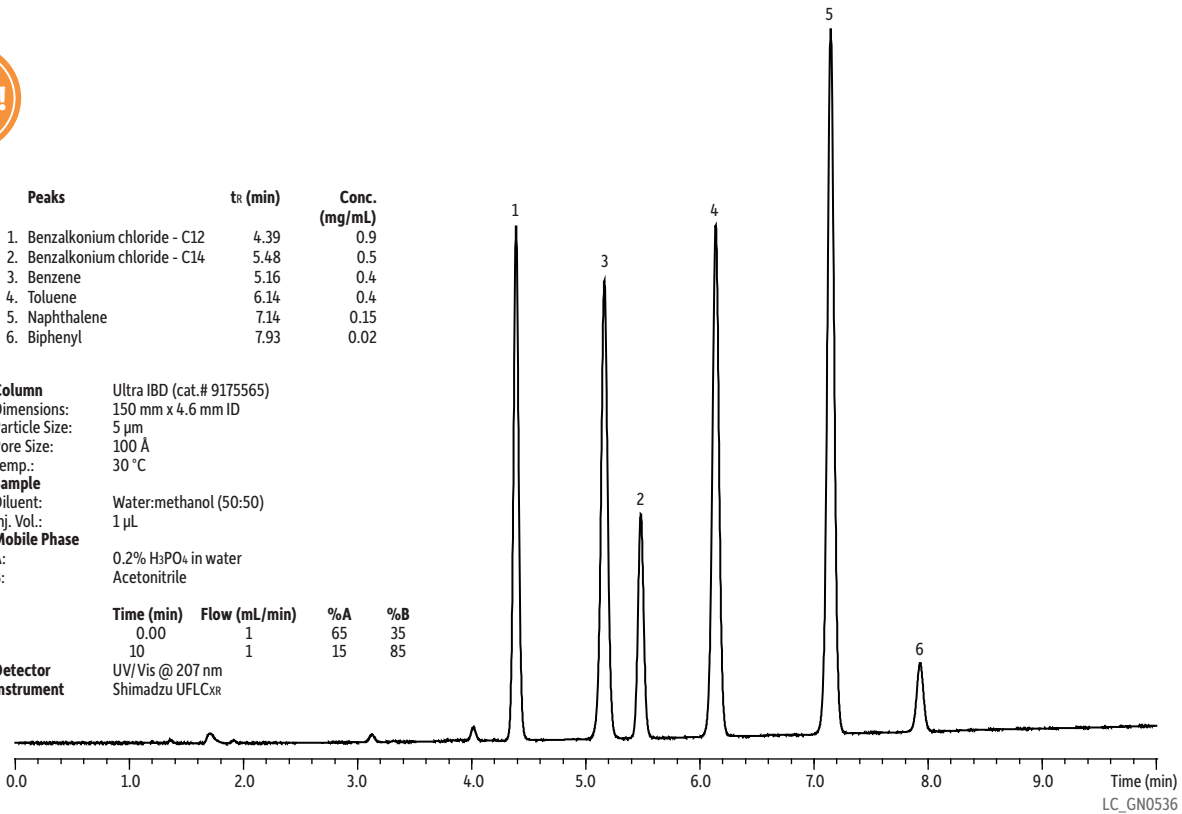
NEW!

Peaks	t_R (min)	Conc. (mg/mL)
1. Benzalkonium chloride - C12	4.39	0.9
2. Benzalkonium chloride - C14	5.48	0.5
3. Benzene	5.16	0.4
4. Toluene	6.14	0.4
5. Naphthalene	7.14	0.15
6. Biphenyl	7.93	0.02

Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	Water:methanol (50:50)
Inj. Vol.:	1 µL
Mobile Phase	
A:	0.2% H_3PO_4 in water
B:	Acetonitrile

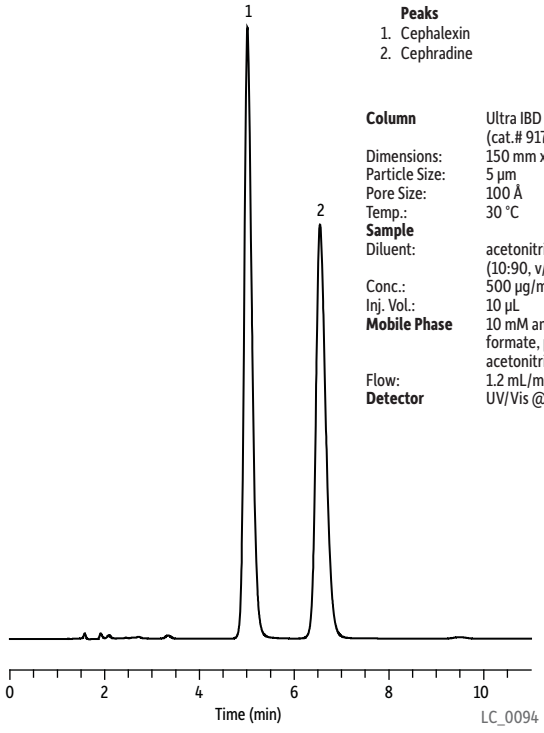
Time (min)	Flow (mL/min)	%A	%B
0.00	1	65	35
10	1	15	85

Detector	UV/Vis @ 207 nm
Instrument	Shimadzu UFLC$_{XR}$



LC_GN0536

Antibiotic Cephalexin on Ultra IBD

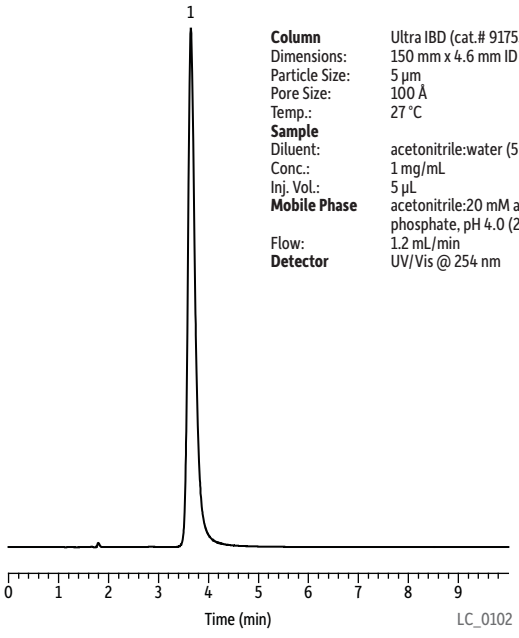


Peaks
1. Cephalexin
2. Cephradine

Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	acetonitrile:water (10:90, v/v)
Conc.:	500 µg/mL
Inj. Vol.:	10 µL
Mobile Phase	10 mM ammonium formate, pH 2.5: acetonitrile (90:10)
Flow:	1.2 mL/min
Detector	UV/Vis @ 270 nm

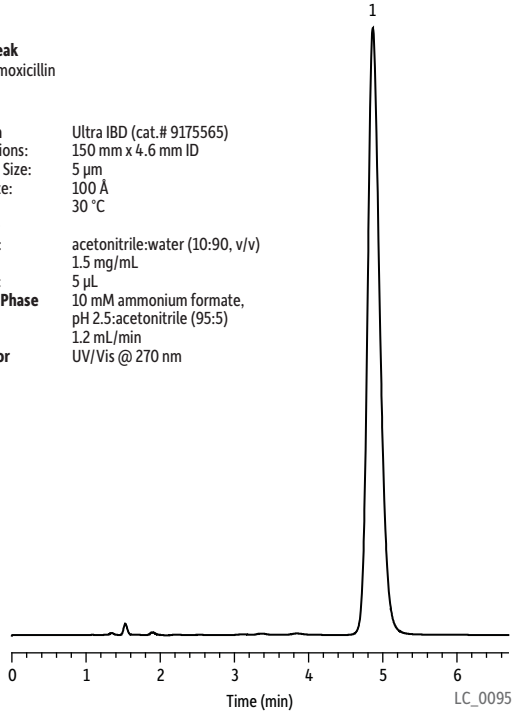
Antibiotic Cephaloridine on Ultra IBD (Reversed Phase)

Peak
1. Cephaloridine



Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	27 °C
Sample	
Diluent:	acetonitrile:water (50:50, v/v)
Conc.:	1 mg/mL
Inj. Vol.:	5 µL
Mobile Phase	acetonitrile:20 mM ammonium phosphate, pH 4.0 (20:80, v/v)
Flow:	1.2 mL/min
Detector	UV/Vis @ 254 nm

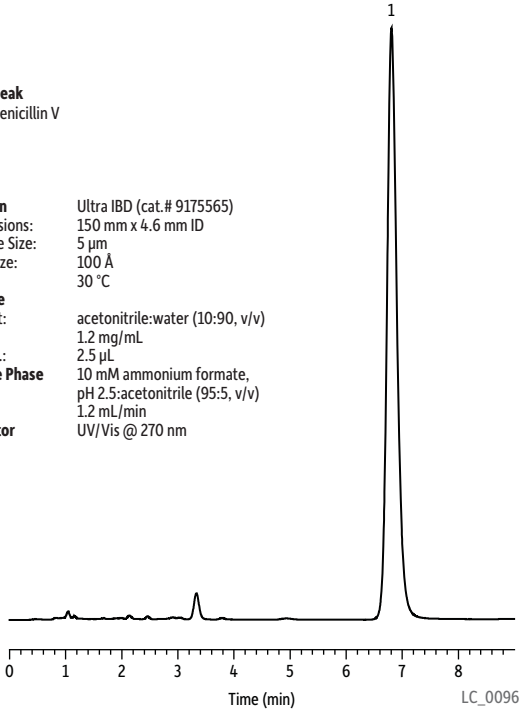
Antibiotic Amoxicillin on Ultra IBD



Peak
1. Amoxicillin

Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	acetonitrile:water (10:90, v/v)
Conc.:	1.5 mg/mL
Inj. Vol.:	5 µL
Mobile Phase	10 mM ammonium formate, pH 2.5:acetonitrile (95:5)
Flow:	1.2 mL/min
Detector	UV/Vis @ 270 nm

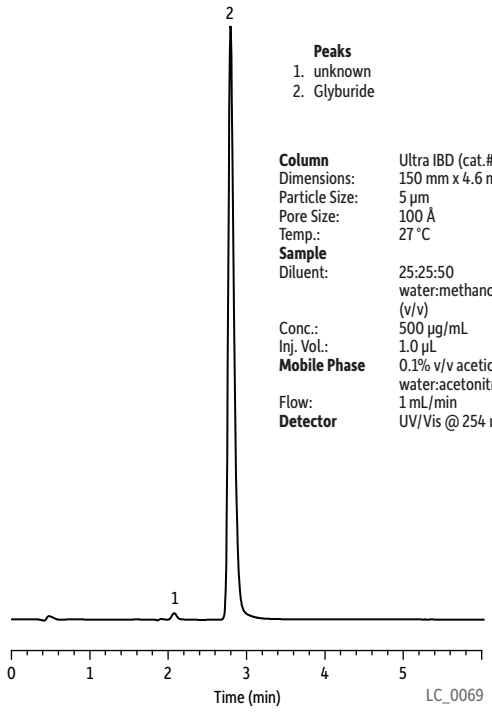
Antibiotic Penicillin V on Ultra IBD



Peak
1. Penicillin V

Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	acetonitrile:water (10:90, v/v)
Conc.:	1.2 mg/mL
Inj. Vol.:	2.5 µL
Mobile Phase	10 mM ammonium formate, pH 2.5:acetonitrile (95:5, v/v)
Flow:	1.2 mL/min
Detector	UV/Vis @ 270 nm

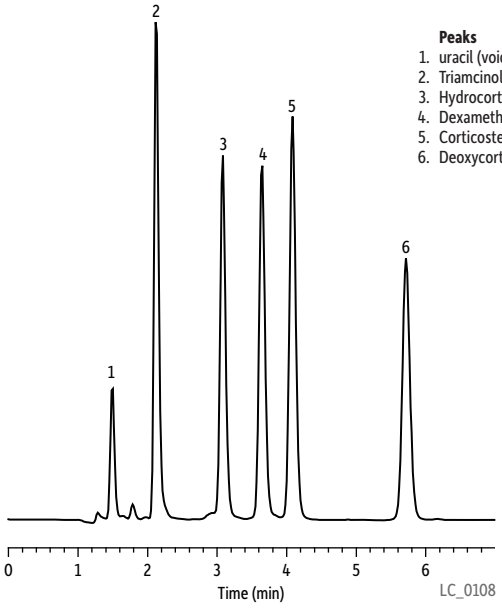
Antidiabetic Glyburide (Glybenclamide) on Ultra IBD



Peaks
1. unknown
2. Glyburide

Column	Ultra IBD (cat.# 9175565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	27 °C
Sample	
Diluent:	25:25:50 water:methanol:acetonitrile (v/v)
Conc.:	500 µg/mL
Inj. Vol.:	1.0 µL
Mobile Phase	0.1% v/v acetic acid in water:acetonitrile (95:05)
Flow:	1 mL/min
Detector	UV/Vis @ 254 nm

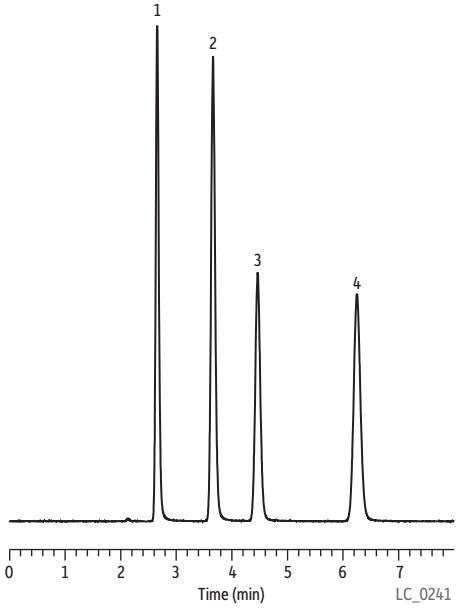
Corticosteroids on Ultra C18



Peaks
1. uracil (void marker)
2. Triamcinolone
3. Hydrocortisone
4. Dexamethasone
5. Corticosterone
6. Deoxycorticosterone

Column	Ultra C18 (cat.# 9174565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	100 Å
Temp.:	30 °C
Sample	
Diluent:	mobile phase
Conc.:	100 µg/mL
Inj. Vol.:	5 µL
Mobile Phase	water:methanol (30:70, v/v)
Flow:	1.0 mL/min
Detector	UV/Vis @ 220 nm

Xanthines on Pinnacle® DB C18



Peaks	Conc. (µg/mL)
1. Theobromine	225
2. Theophylline	418
3. β-hydroxyethyltheophylline	418
4. Caffeine	400

Column	Pinnacle® DB C18 (cat.# 9414565)
Dimensions:	150 mm x 4.6 mm ID
Particle Size:	5 µm
Pore Size:	140 Å
Temp.:	27 °C
Sample	
Diluent:	mobile phase
Inj. Vol.:	2 µL
Mobile Phase	20 mM KH_2PO_4, pH 3.0:acetonitrile (90:10)
Flow:	1.0 mL/min
Detector	UV/Vis @ 254 nm

Compound Index for GC Chromatograms

Compound Index for GC Chromatograms

Compound Index for GC Chromatograms

Compound Index for LC Chromatograms

Compound Index for Reference Standards

Compound Index for Reference Standards

Compound Index for Reference Standards

What are Certified Reference Materials (CRMs)?

A CRM is a reference standard that meets the following set of strict criteria defined under ISO Guide 34 and ISO/IEC 17025:

- All raw materials in the standard must be characterized via qualified methods on qualified instruments.
- The reference standard must be produced in an ISO-accredited lab under documented procedures.
- The reference standard must fall under at least one of the chemical classes for which the lab has been approved under its scope of accreditation.

To learn more about Restek's ISO quality credentials and to view our certificates (including scopes of accreditation), visit **www.restek.com/iso**

Compound Index for Reference Standards

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NOW ONLINE!

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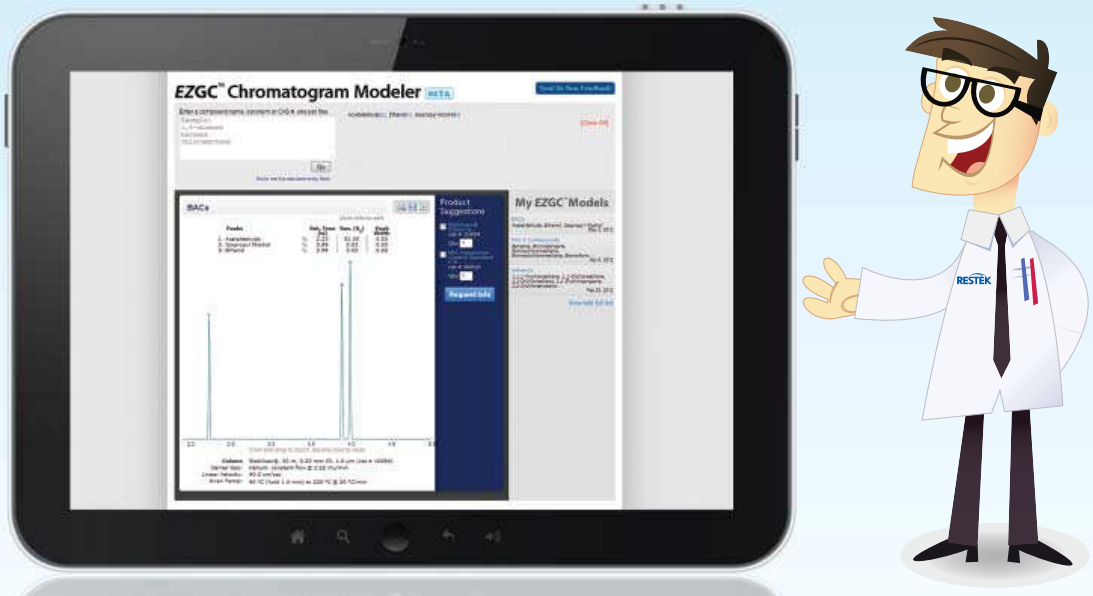

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